THE

AMERICAN REVIEW OF TUBERCULOSIS
ABSTRACTS OF TUBERCULOSIS

VOLUME XLI MAY, 1940 ABST. No. 3

CONTENTS

	Pages
Bacteriology (*concluded*)	57–67
Immunology and Serology (*tuberculin*)	67–79
Diagnosis	80–80

Concentration and Culture Methods.—Seven hundred and ninety-six sputa negative on direct examination yielded 2.9 per cent positive findings after concentration. Ten per cent of the total number of positive specimens for the year were obtained by this method. Four and one-half per cent of 555 microscopically negative sputa were positive by the culture method using Petragnani's medium. Eighteen and two-tenths per cent of the total number of positive sputa for the year were obtained either by concentrated smear or by culture. All acid-fast bacilli isolated by culture must be tested for virulence in guinea pigs before they may safely be considered tubercle bacilli. Cultures proved superior to animal inoculations when these methods were run parallel on a series of 84 body fluids. The culture method used was simple and was quite practical for use in a public health laboratory.—*The Routine Use of Concentration and Culture Methods for the Detection of Tubercle Bacilli in Microscopically Negative Sputa and Other Body Fluids, E. Petran & A. Perry, J. Lab. & Clin. Med., February, 1939, xxiv, 539.*—(*F. G. P.*)

Culture versus Guinea Pig Inoculation.—One hundred and seventy-one specimens negative on examination of stained concentration smears were cultured on Petragnani's medium and inoculated into guinea pigs. Of these, 31 became positive by culture as compared with 26 by guinea pig inoculation. On two occasions cultures did not yield positive results when the slides were positive and the corresponding guinea pigs succumbed to intercurrent infections in too short a period for development of tuberculous lesions. A low incidence of contamination (4.5 per cent of the total number of tubes) is attributed in a large degree to the fine state of dispersion of the material introduced upon the slants, allowing intimate contact of all particles with the bacteriostatic agent used. Petragnani's medium is an effective agent in the isolation of tubercle bacilli from contaminated material and appears to possess a slight superiority over the guinea pig.—*Culture versus Guinea Pig Inoculation in the Diagnosis of Tuberculosis, W. A. Murphy & D. R. Duerschner, J. Lab. & Clin. Med., October, 1938, xxiv, 70.*—(*F. G. P.*)

Guinea Pig Inoculation for Diagnosis of Tuberculosis.—Four-tenths of a cc. of the untreated infective material is injected intracutaneously in a shaved area. Within seven to twenty-one days, or in unusual cases later, a nodule appears at the site of the injection, which averages 2 mm. in diameter. Smears are made from the nodule and examined for the presence of acid-fast bacilli. As soon as the inguinal lymph nodes have formed on the side of the injection, the guinea pig may be killed and an autopsy performed to verify the early report. In the total number of 173 guinea pigs included in this series, tubercle bacilli were recovered 72 times. The average time for a positive diagnosis was twenty days, ranging from six to thirty-one days. Of the 173 guinea pigs injected, only 5 died before the presence or absence of tubercle bacilli in the fluid could be determined.—*A More Rapid Method of Guinea Pig Inoculation for the Diagnosis of*

Tuberculosis, C. I. Woolsey, J. Lab. & Clin. Med., May, 1939, xxiv, 855.—(F. G. P.)

Gastric Lavage.—The examination of gastric contents for tubercle bacilli holds a recognized place in the diagnosis of pulmonary tuberculosis. It has been found at Sea View Hospital that such examinations occasionally are positive for acid-fast bacilli even when all other clinical and roentgenological and laboratory examinations entirely refute the possibility of the presence of tuberculosis. It therefore seemed probable that these apparently falsely positive results were due to contamination of glassware or gastric tubes or other equipment used in gastric lavage. By experimental procedure it was found that the usual method of cleansing and sterilizing the equipment did not preclude the possibility of clumps of bacilli, dead to be sure, but none the less stainable, remaining in the tubing or on the stoppers. Of course guinea pig inoculation or culture of gastric contents will prove whether or not there are viable bacilli in the stomach. It is therefore proposed that more rigid methods of cleansing and sterilization be utilized. Glassware should be boiled in a 5 per cent solution of lysol for twenty to thirty minutes and then thoroughly rinsed with water. The materials are then soaked in a solution of potassium dichromate and sulfuric acid for one hour and then washed with water until free of the acid. Following a period of one hour in a hot air sterilizer at 150° C., the bottles are immediately corked and stored for use. Rubber corks are boiled in a 2 per cent solution of sodium hydroxide until all extraneous matter has been softened. Following this they are scrubbed, rinsed in water, and then immersed in 95 per cent alcohol. Just before use the stopper is grasped at its upper end, and after the alcohol has drained off, the cork is passed through a flame to burn off all organic material. Gastric tubes, following use, are soaked in cold water for twenty minutes and then flushed with water until the water comes through clear. A 2 per cent lysol solution is then forced through the tube and it is again cleansed with cold water. They are then repeatedly washed with a solution of 4 per cent sodium hydroxide or boiled in a solution of 2 per cent sodium carbonate for fifteen minutes. They are washed thoroughly with cold running water and boiled in a sterilizer for fifteen minutes. When not in use the tubes are stored in a covered, nonsterile jar. Just before being used they are boiled in a sterilizer for five minutes. It was found that this method of cleansing and sterilizing was effective in dislodging all particles of solid or albuminous matter that might otherwise cling to the insides of the tubes or in the little pits in rubber stoppers.—*Pitfalls of the Gastric Examination for Tubercle Bacilli, S. H. Belgorad & P. Schain, Quart. Bull. Sea View Hosp., January, 1939, iv, 182.—(A. A. E.)*

Tubercle Bacilli in Urine.—Petroff's tannic-acid method for concentration of tubercle bacilli from urine was found to be superior to direct centrifugation for one hour. However, the good results with this method seemed to depend upon spontaneous precipitation of urates from acidified, chilled urine rather than upon the use of tannic acid. Similar results were obtained if the tannic acid was omitted. The second stage in Petroff's method could be eliminated since it resulted in the loss of the majority of bacilli. The use of milk as a fixative for the sediments to glass slides is emphasized.—*Analysis of Present Methods of Collecting Tubercle Bacilli from Urine, H. A. Feldman & J. H. Hanks, Proc. Soc. Exper. Biol. & Med., March, 1939, xl, 385.—(F. B. S.)*

Tubercle Bacilli in Urine.—The statement made by Foulerton and Hillier in 1901 that tubercle bacilli can be secreted by intact kidneys is corroborated by the animal experiments of the author. Rabbits were injected intravenously with human and bovine tubercle bacilli and catheters were inserted into either the bladder or ureters of the animals. Urine specimens collected a few minutes after injection and at regular intervals thereafter contained no albumen and gave positive cultures at intervals. Microscopical examination of the kidneys five hours later failed to demonstrate tuberculous changes. The mechanism for the secretion of tubercle bacilli by intact kidneys is not entirely clear, but Störk attempts to explain it on the basis of increased glomerular capillary permeability as the result of the toxic effects of the tubercle bacilli carried to the kidneys. Störk, however, stated that the secretion of tubercle bacilli could exist for a short time only due to the obstruction of the tubules by tuberculous infiltrations.—*Beobachtungen über Bazillenausscheidung durch die Niere bei der experimentellen Kanichentuberkulose, Y. Tsuge, Ztschr. f. Tuberk., October, 1938, lxxxi, 39.—(A. B. C.)*

Tubercle Bacilli in Nontuberculous Lung Tissue.—In 1927 Opie and Anderson found, by animal inoculation, virulent tubercle bacilli in the primary complex in 208 instances from 169 individuals dying from causes other than tuberculosis. This was in Philadelphia. Since the material examined was obtained from latent or healed

lesions these authors questioned whether the tubercle bacilli were present within the structure of the focal lesions or in the peripheral tissue in which the lesions were embedded. In answer to this question guinea pigs were injected with lung tissue from the apices which were grossly without evidence of tuberculosis or fibrous scars; lung tissue presumably free from tuberculous lesions from the base of the lungs; and apparently nontuberculous lymph nodes from the hilum or the tracheobronchial tree. It was found that tubercle bacilli were present in tissues removed from 15, or 45.5 per cent, of the 33 individuals in whom the character of latent tuberculosis consisted of fibrocaseous lesions of the apices, fibrous scars of the apices and caseous encapsulated or calcified nodules of the lungs and contiguous lymph nodes. A comparable study was made by the authors of the present article on material secured at Rochester, Minnesota. Tissues from 51 unembalmed bodies were utilized for the inoculation of guinea pigs. The age distribution was from two and one-half to ninety-three years with the largest number of cases between fifty and sixty-nine years inclusive. All were white. Thirty-four were males and 17 were females. The bodies selected for the study represented individuals who, with one exception, had died of causes other than tuberculosis. In 12 of the bodies no gross or microscopical evidence of tuberculosis was found, while in 38 there were lesions of latent or healed tuberculosis. In the majority of instances the signs of primary tuberculosis present were those of the primary complex. Material for the inoculation of guinea pigs consisted of what appeared to be nontuberculous portions of the upper and the lower lobes of each lung and the apparently nontuberculous hilar lymph nodes. In all but 3 cases, three suspensions of tissues were prepared from each body and were used to inject 6 guinea pigs. A total of 150 suspensions was utilized to inject a total of 300 animals. Positive results were obtained from only 3 individuals and since in one of these the cause of death was tuberculous enteritis and peritonitis, only 2 positive cases need be considered. In one case tubercle bacilli, definitely bovine in type, were obtained from the spleen of one of 2 guinea pigs previously inoculated with a composite suspension prepared from presumably normal tissues from the parenchyma of the upper and lower lobes of the left lung. In another case tubercle bacilli were demonstrated from the hilar lymph nodes. The results of this study, made of material from an area where the morbidity from tuberculosis is not high, indicate that virulent tubercle bacilli are infrequently present in the presumably nontuberculous tissue of the lungs of individuals dying of causes other than tuberculosis.—*The occurrence of Virulent Tubercle Bacilli in Presumably Non-tuberculous Lung Tissue, W. H. Feldman & A. H. Baggenstoss, Am. J. Path., September, 1939, xv, 501.*—(*J. S. W.*)

Tubercle Bacilli in Scars, Lymph Nodes and Normal Lung.—The possibility of the presence of tubercle bacilli in scarred tuberculous lesions is a known fact. Likewise the existence of tubercle bacilli in a lymph node macroscopically nontuberculous, recovered at autopsy in bodies otherwise free from any clinical tuberculosis and sometimes even free from scars of anatomical tuberculosis, has been shown on several occasions. A study was made to evaluate the frequency of each of these possibilities in a comparative study. One hundred and fifty-seven specimens were examined from 81 patients between the ages of forty and sixty, all free of clinical tuberculosis, past or present. The tissue fragments were from primary foci (21), calcified nodules of reinfection (21), from apical scars (34), whole bronchomediastinal lymph nodes without calcification (40) and fragments of healthy lung tissue (14). These were all collected with aseptic precautions. The tissue fragments were ground up, concentrated and divided into two parts, one part being used for inoculation into guinea pigs, the other part used for cultures. The guinea pigs were sacrificed at the end of three months. The first part of the study was an evaluation of the cultural method over the animal inoculation method. Ninety-nine cases were studied in this manner. The inoculation method proved to be definitely superior to the cultural method. The cultures yielded in 18 instances a contamination with secondary organisms, too great to permit the few tubercle bacilli contained in the specimens to grow. In the guinea pigs the rare tubercle bacillus produced allergic manifestations between fifty to seventy-seven days after the inoculation. The remaining 58 cases were studied by guinea pig inoculation alone. In the first series the lymph nodes which showed calcification were examined for the presence of tubercle bacilli. In the second series the lymph nodes which showed no evidence of calcification were used in their entirety. These bronchomediastinal nodes were from cases which presented no tuberculous scars or which showed evidences of scars elsewhere in the lung. The tissue fragments which were inoculated were first examined histologically. They were found to be perfectly normal in some instances, sometimes showed anthracosis and some-

times sclerosis and anthracosis. The third series constituted the examination of healthy lung tissue. From these experiments the following conclusions were drawn. The calcified and sclerotic scars contained tubercle bacilli very rarely. The broncho-mediastinal lymph nodes, whether calcified or not, contained tubercle bacilli in almost two-thirds of the cases. The normal lung showed a virulent tubercle bacillus very rarely. The tubercle bacilli recovered from the guinea pigs were without exception virulent bacilli.—*Sur la virulence de cicatrices tuberculeuses pulmonaires, de ganglions broncho-médiastinaux et de fragments de poumons sain, A. Saenz & G. Canetti, Compt. rend. Soc. de biol., July 2, 1938, cxxviii, 829.*—(*M. T. W.*)

Tubercle Bacilli from Acne.—A puncture was made of a lesion on the chin of a twenty-three year old woman suffering from acne on the face, neck, axilla and pubis. Material from the acne lesion was inoculated into 3 guinea pigs. One animal sacrificed three months later showed a bilateral inguinal adenopathy. Cultures made from the lymph node on Löwenstein's medium were negative for acid-fast bacilli. The rest of the lymph node was digested and inoculated into 3 more guinea pigs. One of these guinea pigs of the second passage showed, two months later at autopsy, marked hypertrophy of the iliac and mesenteric lymph nodes. The internal organs, particularly the lungs and spleen, showed fibrocaseous lesions in which acid-fast bacilli were found. The inguinal lymph node contained numerous acid-fast bacilli. Pus from this node when inoculated into guinea pigs produced fatal inoculation tuberculosis, but again cultures on Löwenstein's medium were negative for tubercle bacilli. Cultures from the second guinea pig of the second passage showed a scanty growth of acid-fast bacilli. Animal inoculations of the organisms showed them to be tubercle bacilli of a human strain. To confirm these findings another biopsy of the acne lesions of the young woman was performed. Cultures and animal inoculations were again made. The cultures were all negative for tubercle bacilli. Serial passage was made of the lymph node of one of the animals which had also showed a markedly enlarged spleen. Acid-fast organisms could not be demonstrated microscopically nor by cultures. One of the guinea pigs of passage showed hypertrophied inguinal lymph nodes in which acid-fast bacilli were found. In the other guinea pig evidence of inoculation tuberculosis was seen, such was inguinal adenitis in which giant cells were present and intracellular debris of acid-fast organisms and a few pulmonary nodules. Cultures of these organs however failed to reveal tubercle bacilli. Only once were the organisms isolated on culture despite the many attempts. It was concluded that the lesions of conglobate acne were caused by a tubercle bacillus of a human strain with a markedly attenuated virulence.—*Sur un bacille tuberculeux isolé d'un cas d'acné conglobata, A. Sezary, J. Bablet & F. Bloch, Compt. rend. Soc. de biol., November 26, 1938, cxxix, 734.*—(*M. T. W.*)

Oxygen Restriction and Tubercle Bacilli.—Human and avian tubercle bacilli were subjected to abrupt, extreme deprival of moisture and oxygen. Tubercle bacilli in glass tubes were subjected to a high vacuum by a mercury pump and chemical oxygen "getter," of caesium azide crystals; after ten months' confinement at 37° C. they were tested for survival by culture and by animal inoculation. Human and avian bacilli were also subjected to all conditions resulting from continuous incubation on glycerine agar in glass sealed tubes. In these tubes therefore, in a moist warm state, they respired in a considerable but limited supply of oxygen and also against their own accumulation of metabolic end products. In control tubes, not sealed, they respired with an unlimited supply of oxygen and with escape of gaseous end products. The results show that even at 37° C., a temperature conducive to active metabolism, human and avian tubercle bacilli may both survive prolonged and extreme oxygen deprival when combined with utmost desiccation. Mature cultures of avian tubercle bacilli, when flame sealed and incubated on glycerine agar, remain viable for twenty days, but after thirty days of incubation lose all viability. Human tubercle bacilli grown for two to four weeks on glycerine agar, glass sealed in their cultures, and further incubated for thirty-three days, are difficult to grow but may retain a remnant of infectious power. On further incubation up to forty-six or sixty-two days the bacilli fail to multiply either on medium or in the guinea pig and are doubtlessly killed. The causes of death have not been conclusively determined. Novy and Soule demonstrated a diminution of molecular oxygen and accumulation of carbon dioxide in sealed cultures. These findings may or may not be a complete explanation. One may reasonably assume that traces of oxygen diffuse out of the culture medium for many months. Yet it may be found that bacilli can survive oxygen deprival when dry, and not a much less rigorous deprival when wet. As to the

separate lethal action of carbon dioxide, Novy and Soule demonstrated that in the presence of oxygen, human tubercle bacilli not only survived, but grew in strong concentrations of carbon dioxide. Results with avian tubercle bacilli, to be elsewhere presented, showed that special conditions are necessary for killing even in the presence of high pressures of carbon dioxide. Yet, if there is a lethal end-product of the metabolism of tubercle bacilli, it seems likely from the facts given in the experiment with avian cultures on glycerine agar in sealed glass tubes that such an end product is gaseous. The cause of death may or may not have significance for the field of pathology. Meanwhile, the method of killing seems simple and dependable and is available for trial in the field of immunology.—*Survival and Death of Tubercle Bacilli Subjected to Oxygen Restriction, T. S. Potter, J. Infect. Dis., May-June, 1939, lxiv, 261.*—(*F. G. P.*)

Resistance of Acid-fast Bacilli to Chemicals.—The resistance of the different types of tubercle bacilli, as well as some acid-fast saprophytes, to antiformin, hydrochloric acid, sulphuric acid, acetic acid and oxalic acid was studied. Bacillary suspensions were exposed for varying periods of time to different concentrations of the chemicals, washed and planted on suitable egg media. The author found that the human, bovine and avian tubercle bacilli were resistant to antiformin, sulphuric acid, and oxalic acid, but were readily destroyed by acetic acid. The acid-fast water bacillus, trumpet bacillus and the acid-fast bacilli isolated from tuberculosis of frogs, snakes and turtles showed a marked resistance to antiformin, sulphuric acid, hydrochloric acid and oxalic acid, but less resistance to acetic acid. The timothy bacillus, milk bacillus, butter bacillus and smegma bacillus were readily destroyed by antiformin and by sulphuric acid, but were resistant to oxalic acid and to a less degree to hydrochloric acid and to acetic acid.—*Vergleichende Untersuchungen über die Widerstandsfähigkeit von Tuberkelbazillen und säurefesten Saprophyten bestimmten Chemikalien (Antiformin, organischen und anorganischen Säuren) gegenüber, G. Abel, Zentralbl. f. Bakt., February, 1939, cxliii, 225.*—(*J. D. A.*)

Acetylpolysaccharides.—Almost completely nitrogen-free acetylpolysaccharides were prepared from defatted human tubercle bacilli essentially according to the method of Heidelberger and Menzel. They gave a precipitin reaction with homologous immune serum up to a dilution of 1:100,000. The sera of actively tuberculous individuals gave a variable degree of positive precipitin reactions with these polysaccharides in 82 per cent of 34 cases. The sera of 7 out of 17 leprous individuals gave a slightly positive reaction. Of a small group of sera derived from normal individuals none gave a positive reaction. Preliminary attempts indicate that these polysaccharides do not elicit the production of precipitin antibodies in rabbits. In tuberculous guinea pigs highly sensitive to tuberculin, the intracutaneous injection of these substances causes some redness and induration which lasts for two days. They differ from Old Tuberculin in that they cause no necrosis.—*Über die biologische Wirkung der Azetylpolysaccharide aus humanen Tuberkelbazillen, Y. Takeda, T. Ohta & M. Sato, Ztschr. f. Immunitätsforsch., August, 1939, xcvi, 326.*—(*M. B. L.*)

Riboflavin Produced by Tubercle Bacilli.—Riboflavin was isolated from Sauton's medium on which the R1 strain of tubercle bacilli had grown, and it was identified by means of the fluorescence spectrum band from 494 to 614 mμ. A quantitative method of fluorescence spectrography was used to determine the amount of riboflavin produced by four different strains of tubercle bacilli.—*Isolation and Determination of Riboflavin Produced by Tubercle Bacilli in Culture Media, C. H. Boissevain, W. F. Drea & H. W. Schultz, Proc. Soc. Exper. Biol. & Med., December, 1938, xxxix, 481.*—(*F. B. S.*)

Chemistry of Rat Leprosy Bacilli.—By microincineration it was found that the mineral ash of leprous nodules was mostly due to the cells of the host. The green shade of fluorescence in ultraviolet rays was due mainly to the contained bacilli. A method is described for separating the bacilli found in nodules from the cellular material. Spectrographic analyses of bacilli separated in this manner showed the phosphorous calcium ratio to be greatly increased over that found in normal tissue fluids similarly obtained, but the content of sodium, magnesium and potassium to be practically the same.—*Physical and Chemical Properties of Rat Leprosy Bacilli, E. V. Cowdry, A. Ravold & D. M. Packer, Proc. Soc. Exper. Biol. & Med., June, 1939, xli, 341.*—(*F. B. S.*)

Sulfanilamide *in vitro*.—Various concentrations of sulfanilamide, ranging from 1:100 to 1:100,000, were added to a nutrient egg agar medium. The medium consisted of a mixture of 0.8 per cent peptone, 1.7 per cent starch, 0.8 per cent agar, 3.5 per cent

glycerine, 26 per cent egg, and gentian violet 1:30,000. Two drops of a suspension showing 8 to 10 bacilli per 100 power oil immersion field, of a twenty day old culture of tubercle bacilli, were seeded upon the medium. After three weeks' incubation, no growth was observed in tubes with 1:100 and 1:1,000 concentration of sulfanilamide. There was some inhibition with 1:10,000 concentration and luxuriant growth with 1:25,000 and 1:100,000. Results were the same after six weeks. In a second series, a heavier suspension of bacilli was used. No growth was observed with sulfanilamide 1:500 and 1:1,000, retarded growth with 1:5,000, and slight retardation of growth with 1:10,000. In a third series, a light suspension of bacilli was used. No growth was observed at three weeks with sulfanilamide 1:1,000, 1:2,500, and 1:5,000, but growth was definitely inhibited with 1:7,500 and slightly with 1:10,000. A suspension of tubercle bacilli in a buffer solution was mixed with pleural transudate of the same hydrogen-ion concentration. Sulfanilamide in solution was used in concentrations: 1:1,000, 1:2,500, 1:5,000, 1:7,500, and 1:10,000. Samples were withdrawn at intervals up to 144 hours and seeded upon sulfanilamide-free media. No bactericidal action was observed in any of the concentrations of the drug. The findings indicate that, under the conditions specified, sulfanilamide in certain concentrations exerts an inhibitory effect upon the growth of the tubercle bacillus *in vitro*.—*The Action of Sulfanilamide upon the Growth of the Tubercle Bacillus in vitro, H. C. Ballon & A. Guernon, J. Thoracic Surg., December, 1938, viii, 184.*—(*L. F. B.*)

Action of Bacterial Filtrates on Tubercle Bacilli.—The influence of certain bacteria and their metabolic products on the growth of the tubercle bacillus was investigated. To the broth filtrate of different bacteria were added varying amounts of a human type tubercle bacillus and inactivated rabbit serum. The growth of the tubercle bacilli in deep culture was observed at weekly intervals for a period of two months. It was found that bacterial filtrates from *B. coli*, *B. prodigiosus*, *M. smegmatis* and the "frog" bacillus inhibited the growth in deep culture of the tubercle bacilli. Filtrates from *B. proteus*, *B. subtilis*, "milk" bacillus, tubercle bacillus and *Staphylococcus aureus* had little or no effect on the growth of tubercle bacilli. The author believes that the inhibition of growth is due to the presence of a ferment, although the inhibitory action of metabolic products cannot be excluded. No relationship was found to exist between the pH of the filtrates and their effect on the growth of the tubercle bacilli.—*Untersuchungen über den Einfluss von Kulturfiltraten verschiedener Bakterien auf das Wachstum von Tuberkelbazillen in der Tiefenkultur, W. Sarnowiec, Zentralbl. f. Bakt., February, 1939, cxliii, 232.*—(*J. D. A.*)

Growth of Tubercle Bacilli in Blood.—Tubercle bacilli grow well in blood and serum, but their growth is inhibited if the blood is added to solid medium. Positive results cannot be obtained with small numbers of bacilli.—*Growth of Small Numbers of Acid-fast Bacteria in Blood and Serum, B. Evans & J. H. Hanks, Proc. Soc. Exper. Biol. & Med., January, 1939, xl, 112.*—(*F. B. S.*)

Growth of Tubercle Bacilli.—A study was made of the effects of cupric, manganous, ferric and antimonate ions; extracts of calves lungs, calves hearts, and chicken livers; and of diphenylamine and other organic compounds on the growth of H37. Long's synthetic medium without added iron was prepared from "C.P." or "Reagent" grade chemicals and also from specially purified chemicals in which the traces of impurities were reduced to a minimum. The medium prepared from "C.P." or "Reagent" grade chemicals yielded twice as much growth of H37 as the medium prepared from "purified" chemicals. The addition of iron salts to the "C.P." medium promoted growth only slightly. Nonferrous catalysts added to "purified" medium did not promote growth. The addition of iron salts to "purified" medium, particularly in conjunction with copper, manganese or pyroantimonate ions, either singly or in combinations, yielded more than a twofold enhancement of growth of H37, as compared with "purified" media alone. Copper sulfate in minute traces retarded initial growth, and in concentrations greater than 1:3,000 prevented growth altogether. Potassium pyroantimonate yielded earlier and more abundant growth. Manganous sulfate yielded similar results. The pH of the substrates of the cultures and the early appearance of growth appear to be controlled by the growth history of the inoculating culture as well as the nature of the media used. Diphenylamine retarded initial growth in high concentrations around 1:150,000, and prevented ultimate growth in concentrations greater than 1:20,000 in all media used.—*Chemical Factors Influencing the Growth of Tubercle Bacilli. 1. Metal Catalysts, B. C. Sher & H. C. Sweany, J. Bact., April, 1939, xxxvii, 377.*—(*F. G. P.*)

Growth of Acid-fast Bacteria in Semisolid Media.—The growth of various acid-fast bacteria in semisolid media was investigated. Sauton's medium, enriched with beef serum and made semisolid by the addition of 1 per cent agar, to which was then added either methylene blue, neutral red or litmus, was used. Shake cultures of 12 human, 12 bovine and 7 avian cultures of tubercle bacilli, as well as 4 cultures of acid-fast saprophytes, were studied. It was found that despite uniformity of inoculation the colonies of the human and bovine type tubercle bacilli generally appeared several millimetres below the surface of the medium, while colonies of the avian type tubercle bacillus and the acid-fast saprophytes grew immediately below the surface and were soon surrounded by a hazy zone, 3 to 4 mm. wide, which extended to the surface. The BCG strain grew only in the upper levels of the medium. The character of the growth was the same in the old laboratory strains of tubercle bacilli as in the recently isolated strains. In all of the cultures studied growth appeared first below the surface; later the avian type tubercle bacillus and the acid-fast saprophytes extended to the surface. The observations of L. Lange that colonies of tubercle bacilli, in shake cultures, do not grow uniformly throughout the medium were confirmed. According to the author this method did not permit the differentiation of human from bovine tubercle bacilli.—*Untersuchungen über das Zonenwachstum der Tuberkelbazillen in halbstarren Nährböden nach L. Lange, E. Haefliger, Zentralbl. f. Bakt., February, 1939, cxliii, 238.*—(*J. D. A.*)

Antiscorbutic Vitamin in Culture Medium for Tubercle Bacilli.—Controversy has existed among various investigators as to the value of the addition of vitamin C to medium used for the cultivation of tubercle bacilli. Some workers have claimed that it is not essential for the development of the bacilli, others have claimed that it does not exert a favorable action upon the growth of the bacilli, while still others have concluded that the effect of the addition of ascorbic acid to culture media is not marked one way or the other. Leitner showed that the addition of the antiscorbutic vitamin in amounts of 0.003,5 to 0.014 per cent produced a favorable influence. Boissevain and Spillane showed that the tubercle bacilli obtained optimum growth when the percentage was less than 0.001. A series of experiments was made to determine the value of vitamin C upon the development of tubercle bacilli by using flasks of liquid media of Kirchner, Sauton and Beck and Proskauer to which was added synthetic ascorbic acid in titres of 0.1, 0.01, 0.001 and 0.000,1. This did not change the pH of the medium. In Sauton's medium in the first two weeks there appeared to be a slight retardation of growth of the bacilli, as compared with the control cultures, in the flasks containing the highest concentration of vitamin C. At the end of the experiment no appreciable difference could be detected in any of the flasks over the growth in the control medium. In Kirchner's medium, on the other hand, growth was more rapid during the first fifteen days in the two highest concentrations of ascorbic acid but in the end growth was the same in all the concentrations. In the medium of Beck and Proskauer there appeared to be a more rapid development of tubercle bacilli in the flasks containing 0.001 per cent of vitamin C. Forty-five days after the seeding, the development was more marked in the flasks containing 0.1 per cent. In the other dilutions there was no appreciable difference, but the development was definitely superior in the flasks containing the vitamin than in the control flasks. In all the flasks containing the vitamin, a certain brown coloration was noted in the film of growth of the microorganisms. By using a concentration of 0.5 per cent of vitamin C there seemed to be a retardation of the growth. It was concluded that the addition of vitamin C favored the development of tubercle bacilli only in the first few weeks of incubation. Observations at the end of the experiment which was forty-five days showed little or no favorable action of the vitamin in any of the proportions used in this experiment.—*Influence de l'acide L-ascorbique sur le développment du bacille de Koch dans les milieux liquides de culture, A. Carvalho & C. Vidal, Compt. rend. Soc. de biol., November 19, 1938, cxxix, 687.*—(*M. T. W.*)

Dissociation of Tubercle Bacilli.—By cultivation on Löwenstein's egg medium with 0.75 per cent glycerine, dysgonic (smooth) strains of the human type were isolated, and these strains displayed dissociation into normal eugonic (rough) forms of colony. Detailed description is given of 12 of these, and the variants of 6 of them were tested for virulence on a large series of guinea pigs and rabbits. Another group of 39 strains was described which grew less eugonically than ordinary human strains and which failed to dissociate. A few typical bovine cultures, after cultivation from six to eighteen months, gave dysgonic cultures which produced a few eugonic secondary cultures. From these latter dissociants pure undissociable eugonic cul-

tures could be obtained. Two of these eugonic dissociants were avirulent for guinea pigs and rabbits and were similar in every respect to the BCG strain. Their significance for our understanding of the biology of the BCG strain is discussed. The effect of cultivation in the presence of sodium taurocholate on the dissociated strains was studied. Studies with equal weights of the smooth and rough colonies proved that the former contained more viable bacilli than the latter, a fact of importance when appraising virulence. Smooth strains grew sparsely on Sauton's fluid, and rough human and bovine strains grew vigorously. The same pH curve was found for the rough human and bovine cultures, contrary to Theobald Smith's findings. Acid media stimulated the formation of rough secondary colonies. Dissociation always took place in the direction of smooth to rough, except in one case. The relation of artificially attenuated strains to lupus strains is discussed. Petroff and his coworkers' experiments on dissociation of BCG were not confirmed, but the possibility of BCG reverting into virulent bovine forms is reservedly admitted. The dissociation of a bovine strain and of strain H37 by Steenken and associates was substantiated.—*Dissociation of Tubercle Bacilli. Investigations on the Mammalian Type Including BCG, J. Frimodt-Möller, Acta tuberc. Scandinav. Supplementum II, 1939.*—(*F. B. S.*)

Dissociation of Tubercle Bacilli.—Petroff and Denys have previously reported the dissociation into R and S forms of classical bacilli of Koch. Further attempts were made to dissociate tubercle bacilli of human and bovine strains by the simple method of filiation in long direct lines of colonies which on their various solid media presented colonies of preferential morphological characters which belonged to types R and S. The human strain A which was used in this experiment had been cultured by Arloing forty-one years before and kept in the laboratory where this experiment was made, growing on ordinary gelatin in very small, shiny confluent colonies standing out only slightly from a few of the more salient colonies and orienting themselves toward the R type. Strain C, a human bacillus, was only twenty-seven years old. It grew a little more rapidly and more abundantly on ordinary gelatin than on glycerinated gelatin, but the salient R colonies were more numerous and more characteristic than with the strain A. Cultures on media of Petroff and Löwenstein yielded less abundant and less differentiated growth. than the ordinary gelatin. The growth of these two strains and homogeneous broth cultures of several bovine strains were observed over a long period of time. It was found that in general growth of tubercle bacilli of bovine strains issuing from homogeneous broth culture was more scanty and slower in glycerinated gelatin than on ordinary gelatin. Homogeneous bovine bacilli dissociated themselves more easily and distinctly into R or S types than the human bacilli. Serial cultures did not influence greatly this dissociation. Very fine S colonies gave to their confluence a shininess less marked and of a somewhat drier aspect than the human S colonies. The R colonies were more flat, larger, more maculous and less rough than the human R colonies. Cultures from the bone marrow of the femur of a rabbit inoculated with a homogeneous bovine culture, and cultures from the spleen and liver on ordinary gelatin or gylcerinated gelatin, Petroff's or Löwenstein's media did not yield R colonies as characteristic and abundant as when human strains were inoculated. It was always from the bone marrow that the most distinct R colonies were obtained.—*Dissociation directe des colonies R et S en partant des cultures homogènes en bouillon de souches humaines et bovines, P. Arloing, L. Thévenot & J. Viallier, Compt. rend. Soc. de biol., November 12, 1938, cxxix, 584.*—(*M. T. W.*)

Virulence of Tubercle Bacilli.—Comparative studies as to the virulence of various strains of tubercle bacilli isolated from human sources have not often been undertaken. Hence this study was made in an attempt to answer three questions. (*1*) How is it possible to understand the outstanding differences in the virulence between different strains? (*2*) Do bovine strains of human origin have the same degree of virulence as bovine strains of bovine origin? (*3*) May a relation be established between the clinical form of tuberculosis in the patient and the virulence of the strain studied? This last question will be discussed in a future paper. The present study comprised the determination of the degree of virulence of forty strains of tubercle bacilli. Six human strains were isolated from human adults, six from children. Of the four bovine strains reported, two were from human source and two were from lymph nodes of cattle. The first six strains were isolated from various sources, sputum, pleural fluid, pus and urine. The strains isolated from children came from gastric lavage, cerebrospinal fluid and urine. The following technique for titration was employed. Dosages of 1/100,000 to 1/100,000,000 mg. of a culture fifteen to fifty days old

were inoculated intramuscularly into 3 to 4 guinea pigs of the same weight. The course of the tuberculous infection was followed by periodic observation of the allergic response to tuberculin up to the point of spontaneous death of the animals by generalized tuberculosis. Guinea pigs inoculated with the extreme dilutions of 10^{-6}, 10^{-7} and 10^{-8} were tuberculinized irregularly. Two guinea pigs inoculated with the dilutions of 10^{-8} showed abnormally long anteallergic periods of one hundred and twenty and one hundred and fifty days. The autopsies of these 2 animals revealed a spontaneous tuberculosis of inhalation. It was concluded from this group of studies that there was not a definite difference between the virulence of bovine strains isolated from man and those isolated from cattle. Bovine strains were shown to have no differences in virulence as compared to human strains. The longest anteallergic periods were sixty-five and seventy-seven days when dilutions of 10^{-6} and 10^{-7} were used respectively.—*Recherches sur la virulence de bacilles de Koch récemment isolés de tuberculoses internes diverses provenant de la clinique humaine, A Saenz & H. Brocard, Compt. rend. Soc. de biol., November 26, 1938, cxxix, 743.*—(*M. T. W.*)

Virulence of Tubercle Bacilli.—Material not secondarily infected was weighed and suspended in physiological salt solution so that each cc. contained 0.01 g. of virulent material. This was further diluted making final dilutions varying from 0.1 to 0.000,001 mg. per cc. One cc. of each of these dilutions was inoculated in 3 guinea pigs. Sputum and pus were treated in the same manner except that they were first treated with 4 per cent sodium hydroxide to cut down the growth of secondary organisms. These experiments confirmed former experiments, namely, that lymph nodes of cattle and hogs were considerably less rich in tubercle bacilli than were pulmonary lesions of both man and guinea pigs. The pulmonary products of man contained so many organisms that 0.001 mg. inoculated in guinea pigs killed the animals in less than two months. A fragment of a pulmonary tubercle recovered from a guinea pig dead of tuberculosis following inoculation with bacilli of a human strain, infected three series of guinea pigs when experimentally introduced in as small a dose as 0.000,001 mg. Sputum from tuberculous patients infected guinea pigs in doses varying from 0.001 to 0.000,005 mg. These products contained therefore a maximum of 500,000 living, virulent bacilli per mg. Taking as a basis fifty million bacilli per milligram of a culture, which seemed to correspond to average titres *in vivo* to strains of human type, and admitting that a single bacterium suffices to produce regularly tuberculosis in guinea pigs, then certain patients eliminate 10 mg. of virulent bacilli per gram of sputum. This experiment showed therefore by precise bacteriological technique the enormity of communicability in tuberculosis.—*Détermination, par l'inoculation au cobaye, de teneur des produits tuberculeux en bacilles de Koch, A. Boquet, Compt. rend. Soc. de biol., July 2, 1938, cxxviii, 844.*—(*M. T. W.*)

Mucoid Phase of H37.—A mucoid growth was obtained from old stock strains of H37 on alkaline neopeptone glycerol broth. Freshly growing strains of H37 and the use of other media did not give this type of growth.—*Variability of Tubercle Bacillus. I. Mucoid Phase of the Human-Type Strain H-37, Ruth A. McKinney & R. R. Mellon, Proc. Soc. Exper. Biol. & Med., February, 1939, xl, 298.*—(*F. B. S.*)

Bovine Tubercle Bacilli in Japan.—Tubercle bacilli were isolated from tuberculous lungs, bones and joints, cervical nodes, urogenital tuberculosis and from cases of miliary tuberculosis. The cultures were obtained by treating the material for thirty minutes with either 4 per cent sodium hydroxide or 5 per cent sulphuric acid. After centrifuging and without neutralizing, the treated material was planted on Loewenstein's medium with and without glycerine. From 172 cases 160 cultures of tubercle bacilli were isolated. Because of their rapid and luxuriant growth, and in view of the character and distribution of lesions in rabbits inoculated with the cultures, the authors concluded that the bacilli were of the human type. In reviewing the literature they found that a total of 1,323 cultures of tubercle bacilli had been isolated in Japan, only 13 (0.98 per cent) of which proved to be the bovine type. They conclude that the bovine type of tubercle bacillus is less frequent in Japan than in Europe. This they attribute to the fact that milk is used but little in Japan.—*Ueber das seltene Vorkommen des bovinen Typus von Tuberkelbazillen bei Japanern, R. Kimura & H. Kondo, Zentralbl. f. Bakt., August, 1939, cxliv, 365.*—(*J. D. A.*)

Avian Tuberculosis.—The purpose of this article is to summarize the author's investigation concerning 53 different strains of avian bacilli. These were isolated by aspiration of bone marrow of the long bones and cultured on egg or potato glycerin medium. Metchnikoff was first to point out in

1888 the polymorphism and pleomorphism of avian bacilli in culture, that is, the presence of filaments, branch-like and oblong forms, incubated at a temperature of 43°C., a temperature at which mammalian bacilli cannot survive. Intravenous injection of fresh avian bacilli in fowl or rabbits produces acute, subacute and chronic lesions in direct ratio to the period of incubation. Winn and Petroff were among the first to describe the presence of a yellow-citron pigment on avian colonies different from the human strain. The author concludes as a result of his work that S and R avian colonies yield a pigment whose intensity depends on the strain of bacilli, culture medium and incubation temperature. The pigment has no effect on virulence or morphology. *Conclusions:* (*1*) Egg glycerin base is the most favorable medium for isolation of avian bacilli. (*2*) Their cultures on egg or potato media remain virulent even after a lapse of six years, and retain their initial cultural characteristics. (*3*) Of diagnostic significance is their polymorphism which is never observed in mammalian bacilli. (*4*) The natural path of infection in fowl tuberculosis is by way of the digestive tract. (*5*) Avian organisms are pathogenic for fowl and rabbits. Intravenous inoculation elicits acute, subacute or chronic infection depending on the stage of the disease rather than on dosage of inoculated bacilli. (*6*) The addition of bile to culture media definitely decreases the virulence of avian bacilli. (*7*) The dissociation into S and R variants occurs when suitable media are employed; egg media are best for S colonies and potato-glycerin for R. Fresh colonies are reversible and unstable both *in vivo* and *in vitro* and are equally pathogenic for fowl and rabbit when injected intravenously. Apparently no definite relationship exists between virulence of a strain and cultural aspects. (*8*) Dissociation of S and R variants results essentially from a change in the media employed, that is, it is a phenomenon of adaptation. The difference is purely morphological. (*9*) The presence of pigmentation does not modify the morphology or virulence of the S and R types. (*10*) Nonvirulent avian S and R strains resembling culturally those present in guinea pigs or BCG may be differentiated by their morphology, intensity of pigmentation, toxicity of their tuberculin and especially by their pathogenicity. Attenuated avian bacilli on intravenous injection produce osteo-arthritis in rabbits, while those from guinea pigs or BCG remain innocuous. Attenuated avian bacilli produce no lesions in rabbits on suboccipital injection, whereas those from guinea pigs produce fatal meningitis.—*Recherches sur les caractères biologiques du bacille tuberculeux avaire, A. Saenz, Ann. Inst. Pasteur, December, 1938, lxi, 662.—(J. G.)*

Avian Tubercle Bacillus Wax.—The two principal hydroxy-acids of high molecular weight contained in the avian tubercle bacillus wax have been called avian α- and β-mycolic acids. The avian α-mycolic acid, when heated to 210°–255°C. under 1 mm. pressure, decomposes and a branched-chain pentacosanoic acid, $C_{25}H_{50}O_2$, m.p. 78–79°C., distils off in a yield of 25 per cent. Avian β-mycolic acid when heated to 280°–295°C. under 1 mm. pressure decomposes and yields 21 per cent of normal tetracosanoic acid, $C_{24}H_{48}O_2$.—*The Chemistry of the Lipids of Tubercle Bacilli. LVII. The Mycolic Acids of the Avian Tubercle Bacillus Wax, R. J. Anderson & M. M. Creighton, J. Biol. Chem., July, 1939, cxxix, 57.—(F. B. S.)*

Resistance of Avian Tubercle Bacilli to Low Temperatures.—Avian tubercle bacilli when subjected to low temperatures and repeated freezing and thawing, may survive the temperature of liquid air and even several freezings and may also survive when rapid freezing and thawing is accomplished 20, 40, 80, and even 200 times. It was found that viable organisms, although invariably present after freezing and thawing, are distinctly reduced in their power to multiply in culture and to produce rapidly progressive disease in susceptible animals.—*The Resistance of Avian Tubercle Bacilli to Low Temperature with Especial Reference to Multiple Changes in Temperature, P. Kyes & T. S. Potter, J. Infect. Dis., March–April, 1939, lxiv, 123.—(F. G. P.)*

Avian Tubercle Bacilli in Diphtheroid Cultures.—Several species of diphtheroids were isolated from bovine and porcine lymph nodes, which although pure culturally yet microscopically showed both acid-fast and non-acid-fast rods and when inoculated into experimental animals produced avian tuberculosis occasionally, but not consistently. Purified cultures of the diphtheroids did not produce tuberculosis. Avian tubercle bacilli and these diphtheroids will grow commensally, and the growth of the tubercle bacillus may not be macroscopically detectable. Because diphtheroid and acid-fast organisms are found in the same culture, the assumption cannot be made that the culture is pure and that the diphtheroid is one phase in the life cycle of the acid-fast. The significance of these findings in the isolation of tubercle bacilli is obvious. Although the culture method is superior to the

inoculation of animals for the isolation of avian tubercle bacilli, because large doses are necessary to produce acute tuberculosis in rabbits, the inoculation of animals must still be used for the identification of cultures; and since small doses of avian tubercle bacilli produce chronic localized tuberculosis, the tissues of inoculated animals which show no visible lesions should be cultured.—*The Presence of Avian Tubercle Bacilli in Apparently Pure Cultures of Diphtheroids, J. McCarter & E. G. Hastings, J. Infect. Dis., May-June, 1939, lxiv, 297.*—(*F. G. P.*)

Filterability of Human Leprosy Culture.—Cultures of chrome *B. leprae* (Duval) were filtered weekly through the Seitz filter for three months and at no time could the filtrates be demonstrated to give growth on glycerin agar.—*Filtrability of the Chromogenic Culture (Duval) Obtained from Human Leprosy, W. L. Loving & J. R. Kriz, Proc. Soc. Exper. Biol. & Med., February, 1939, xl, 293.*—(*F. B. S.*)

Complement Fixation in Tuberculosis.—To determine the diagnostic value of the complement fixation reaction in tuberculosis, 1,141 patients were investigated. Meinicke's tuberculosis antigen, the antigen of Witebsky, *et al.*, and a proprietary dried antigen were used. Serological studies were made in all patients, and, in addition, whereever possible, exudates, spinal and joint fluids, and urines were tested for antibodies. It was found that the antibody titre of exudates and joint fluids corresponded with the serum antibody titre, but in no instance was it possible to demonstrate antibodies in the urine of cases of renal tuberculosis. In only a few cases of tuberculous meningitis were antibodies found in the spinal fluid, the failure in the remaining cases being attributed to the abrupt onset and rapid termination of the disease. The results of the complement fixation reaction were compared with the known microscopical and bacteriological findings in each case and were found to be of greatest value in the diagnosis of genitourinary tuberculosis. Less definitive, but of almost equal diagnostic significance, were the results of the complement fixation reactions in the differential diagnosis of pulmonary tuberculosis, nonspecific bronchopneumonias, and early infiltrates, when roentgenological and bacteriological findings were not conclusive. For the diagnosis of surgical tuberculosis and other forms of tuberculosis, the complement fixation reaction did not appear to be of value.—*Die diagnostische Bedeutung der Komplementbindungsreaktion auf Tuberkulose, M. Gundel & W. Heine, Ztschr. f. Tuberk., January, 1939, lxxxi, 289.*—(*A. B. C.*)

Serological Diagnosis of Tuberculosis.—Serological tests, whether complement-fixation reaction or precipitation reaction, are negative in a considerable proportion (about 15 per cent) of patients with tuberculosis. That many of this group develop a positive reaction after a tuberculin injection was previously noted by the authors. They suggest that this phenomenon might be useful in the diagnosis of clinical tuberculosis. Intracutaneous injection of 0.05 cc. of tuberculin followed ten days later by injection of 0.15 cc. was made in 100 persons with negative serological reactions. Fifty of these subjects were nontuberculous. There was no change of reaction in 19 persons who were tuberculin-negative. Thirteen of the remaining 31 nontuberculous subjects developed positive or doubtful serological reactions after the tuberculin injections. Positive or doubtful reactions developed in 32 of 50 patients with glandular or bone tuberculosis. The authors conclude that while a positive serological reaction may be considered suggestive of active tuberculosis, a negative serological reaction, persisting after the injection of tuberculin, occurs in no more than 5 per cent of patients with active disease and may be considered strong evidence against the presence of clinical tuberculosis.—*D'un procédé de "réactivation" dans le stérodiagnostic de la tuberculose, K. Meyer & Froyez-Roederer, Rev. de la tuberc., July, 1939, v, 775.*—(*H. L. I.*)

Antibodies in Tuberculosis.—In the serum of 39 patients clinically free from tuberculosis, suffering from various diseases, complement-fixing antibodies were demonstrable by one or more of the methods of Witebsky, Besredka or Meinicke. In only one instance, however, was a serum positive to the three antigens. The correlation of antibodies and immunity was studied on 39 guinea pigs vaccinated with 50 mg. of heat-killed tubercle bacilli in vaseline oil, 39 vaccinated with a living, slightly virulent strain of tubercle bacillus and 24 unvaccinated controls. Complement fixing antibodies were found in the serum of those treated with the heat-killed vaccine, but not in the serum of those vaccinated with the living culture. The vaccinated animals as well as controls were reinfected with a small amount of a moderately virulent culture of tubercle bacilli. The injection of the weakly virulent organism resulted in tuberculous nodules which in most instances proceeded to heal, but did not result in the production of antibodies. Despite the presence of antibodies among the animals vaccinated with heat-killed bacilli, 18 of 34 animals showed extensive tuberculosis, while

among 34 vaccinated with the living slightly virulent strain who were free of demonstrable antibodies 8 showed slight tuberculosis. From these results it is evident that complement-fixing antibodies play no rôle in controlling the development of tuberculosis, nor do they interfere with the vitality of the tubercle bacillus. The results of this study would suggest that antibodies are produced not only from split products of the tubercle bacillus but also from products of tissue reaction, such as those due to the nonspecific irritation of vaseline oil. The author concludes that the presence of antibodies in tuberculosis does not have the same value as their demonstration in syphilis.—*Ueber die Bedeutung der Antikörper bei der Tuberkulose und den Wert der serologischen Untersuchungsmethoden, unter besonderer Berücksichtigung der experimentellen Meerschweinchentuberkulose, A. Nagel, Zentralbl. f. Bakt., August, 1939, cxliv, 357.*—(*J. D. A.*)

Antibodies in Tuberculosis.—The correlation between immunity in tuberculosis and humoral antibodies was studied. Guinea pigs vaccinated with heat-killed tubercle bacilli in vaseline oil as well as guinea pigs vaccinated with a small amount of living tubercle bacilli of a low degree of virulence were reinfected with small amounts of a moderately virulent strain of tubercle bacilli. The animals were killed five to six months later and the presence of amboceptor and growth-inhibiting substance was determined. Amboceptor was demonstrable in the sera of 5 of 6 animals treated with the vaccine in oil, but was not demonstrable in the sera of the other animals. The extent of the tuberculous process was not correlated with the presence or absence of amboceptor. The growth-inhibiting action of the sera was tested by adding undiluted serum to varying amounts of tubercle bacilli of different virulence. After standing at 37°C. for twenty-four hours the bacilli were collected by centrifuging and were resuspended. The organisms were planted on Petragnani's medium and the time of appearance and number of colonies was noted. It was found that the time of appearance and number of colonies were not appreciably different in the immunized tuberculous or control normal guinea pigs. The extent and course of the tuberculous process bore no relationship to the presence of growth-inhibiting substance. —*Experimentelle Untersuchungen über die wachstumhemmende Kraft des Blutserums von immunisierten tuberkulösen und normalen Meerschweinchen Tuberkelbazillen gegenüber, A. Nagel & M. Fenkner, Zentralbl. f. Bakt., August, 1939, cxliv, 350.*—(*J. D. A.*)

Serodiagnosis of Bovine Tuberculosis.—Serum of horses infected with bovine tubercle bacilli contains antibodies specific for proteins of bovine tubercle bacilli. Antibodies can be obtained in the serum of rabbits inoculated with S strains of bovine tubercle bacilli. R strains of bovine bacilli and human bacilli on the other hand when inoculated into rabbits produce only nonspecific antibodies against the lipoid and polysaccharide antigens common to all tubercle bacilli. Specific protein antibodies exist in tuberculous infections in man due to bovine bacilli. A series of studies on complement fixation reactions were made on tuberculous patients using five antigens, human and bovine protein antigens, digested and undigested and a methyl antigen, after first having checked the antigens on sera of two patients, one known to be infected with bovine tubercle bacilli, the other with human tubercle bacilli. Serum from the patient infected with human tubercle bacilli reacted with the undigested proteins to about the same degree or more weakly as it did with the digested antigen. It contained only the polysaccharide antibody. The serum of the patient infected with bovine tubercle bacilli reacted with the undigested bovine protein antibody more strongly than with the same digested antigen. It thus contained the true protein antibodies. It contained in addition the polysaccharide antibodies, its presence being manifested by the complement fixation reaction with the digested bovine and human proteins. Both sera contained in addition the lipoid antibody. Eighteen sera from a group of 22 patients infected with human tubercle bacilli reacted to the lipoid antigen and 8 to the polysaccharide antigen. Not one of the sera reacted with the human or bovine protein antigen. Out of 18 sera from patients infected with bovine tubercle bacilli, 8 reacted to the bovine protein antigen. Not one of these reacted to the human protein antigen. Twelve sera out of 18 reacted to the polysaccharide antigen and 13 out of 14 reacted to the methyl antigen. A little less than one-half of the sera from the proved cases of infections with bovine tubercle bacilli contained protein antibodies specific for the bovine bacilli. It was particularly interesting to note that the protein antigen reacted with the patient's serum in extremely weak dilutions. The reaction was positive in a dilution of 1 to 1,000,000. It is thus necessary to make dilutions of protein antigen sufficiently high to register the weak reactions and to obtain maximum results. The high sensitivity of protein antibodies for bovine protein antigen is comparable to the cutaneous

sensitivity of man with tuberculin protein.—*Le séro-diagnostic de la tuberculose a bacilles bovins chez l'homme, W. Schaefer, Compt. rend. Soc. de biol., June 24, 1939, cxxxi, 909.—(M. T. W.)*

Serological Differentiation of Human and Bovine Bacilli.—Differentiation of the human type of tuberculous infection from the bovine type has heretofore been made by the time consuming method of the identification of the bacillus which was isolated from pathological products of the patients. Attempts have been made at differentiation by means of skin reactions using tuberculin made with either bovine or human tubercle bacilli. In 1937 experiments were made demonstrating a polysaccharide in both human and bovine bacilli capable of producing intracutaneous reactions in their corresponding infections. Serological methods have failed to differentiate the two infections since the antilipoid and antipolysaccharide antibodies of the two types of bacilli are indistinguishable. More recently antiproteins have been demonstrated in horses inoculated with S strains of bovine tubercle bacilli. This same antibody was found in rabbits inoculated with oily suspensions of S strains of bovine bacilli. These antibodies could not be found in rabbits inoculated with R strains of bovine bacilli nor with human strains. These observations lead to the attempt to demonstrate protein antibodies in patients infected with bovine tubercle bacilli and to diagnose bovine tuberculous infections serologically. Twenty sera of patients with known bovine tuberculous infections and 50 sera from patients with infections with human strains were examined by complement fixation. Not one of the 50 sera from infections with human tubercle bacilli gave a positive reaction with the antigen used in this experiment. Eight of the 20 sera of the patients with bovine infections showed a strong positive reaction, while the remaining 12 showed negative reactions. This experiment clearly demonstrates the presence of antibodies in some sera of patients with bovine infections, totally absent in all cases of the infections with human strains. The presence of this antibody was not found in as high a percentage as previously reported. Its titre was low. Antilipoid and antisaccharide antibodies in the presence of the corresponding antigen were totally inhibited, frequently in quantities of 0.05 and 0.02 cc. of serum. The antiprotein antibody can be separated from the antilipoid and antisaccharide antibodies, a fact which seemed to have a practical interest.—*Identification sérologique des infections tuberculeuses humaines à type bovin, K. Meyer, Compt. rend. Soc. de biol., June 3, 1939, cxxxi, 470.—(M. T. W.)*

Precipitins for Tuberculin.—The behavior of tuberculin proteins of acid-fast bacteria in the precipitin test was studied as a possible means of identification of the bacilli. Acid-fast bacteria were grown on Dorset and Henley's synthetic medium. After the growth had autolyzed, usually three months after inoculation, the cells were removed by a paper and then by a Mandler filter. The filtrate was concentrated by ultrafiltration and washed with 0.5 per cent phenol until a barium chloride test for sulfate was negative. Concentration was continued until the solution contained 0.5 to 1.0 mg. of protein per cc. The precipitins were incited in rabbits by the subcutaneous injections of the antigens in solution, at two to three days intervals, until a total of 25 mg. of protein had been injected. The tuberculin proteins of the human, the bovine and the avian tubercle bacillus are distinguishable by the precipitin test. The tuberculin proteins of the avian tubercle bacilli isolated from the chicken, the cow and the hog, and the protein of Johne's bacillus cannot be differentiated by the precipitin test. The tuberculin proteins of two so-called saprophytic acid-fast bacteria, one isolated from the cow, and one from the hog, are distinguishable from each other and from the proteins of the tubercle bacillus and of the Johne's bacillus. The precipitin test with tuberculin proteins as antigens is useful in identifying unknown acid-fast bacteria when considered in conjunction with cultural and pathogenic characteristics. Further purification of the protein solutions seems necessary before the precipitin test can replace other methods of identification of acid-fasts.—*Precipitins for the Tuberculin Proteins of Acid-Fast Bacteria, J. McCarter, E. M. Kanne & E. G. Hastings, J. Bact., April, 1939, xxxvii, 461.—(F. G. P.)*

Resistance to Tuberculosis.—Previous studies, in which normal and immunized rabbits were injected subcutaneously with melted agar, impregnated with tubercle bacilli and trypan blue, indicated no strict parallel between allergy and immunity. In the present investigation these experiments are repeated on normal and R1-vaccinated guinea pigs, the acquired allergic sensitivity of which is greater than in rabbits and more like that of man. The fate of the tubercle bacilli and the dissemination of the trypan blue were carefully studied. The number of bacilli in the inoculum, in the agar focus,

and in the draining nodes was determined by culture. Also, a remote organ, the liver, was investigated for its bacillary content. The fate of bacilli of infection and reinfection at the portal of entry and in the metastatic foci was, with one exception, essentially the same in guinea pigs as in rabbits. This exception has to do with the early dissemination of tubercle bacilli and trypan blue from the site of inoculation when given in large dosage. Under this condition the bacilli of reinfection reach the draining lymph nodes of the sensitized rabbit more rapidly than they do in the normal animals. In the sensitized guinea pig, however, the reverse is true and the spread of bacilli and dye is retarded. The bacilli and the dye are more effectively fixed in the guinea pig than in the rabbit. These differing fixing capacities of the two species are associated with differences of extracellular character in the inflammation resulting from reinfection. In the guinea pig, whose tissues are highly sensitive to and greatly injured by the tubercle bacillus, the lymphatics adjoining the site of reinfection become thrombosed. In the rabbit whose tissues are moderately sensitized and so less injured by the tubercle bacillus the corresponding lymphatics remain open. In the guinea pig the fibrous network at the site of inflammation forms a fine sieve-like structure. In the rabbit this network forms a coarser barrier. Normal and tuberculous rabbits and guinea pigs were treated with formalized typhoid bacilli, tuberculoprotein and horse serum for the production of antibodies. Later a nonspecific inflammatory exudate was produced in the pleural space of these animals and the titre of this exudate for agglutinins and precipitins estimated. In general, precipitins were found in the exudate in higher concentration in tuberculous guinea pigs than in tuberculous rabbits. Also in the former the titre of the exudate was much higher than that of the blood serum. It was noted that in the acellular agar islands into which, however, the body fluids penetrate, the bacilli multiplied unhindered in the normal animal, whereas in the immune animal a marked inhibition of their growth was evident. To be sure of a complete absence of cells in the focus or about the bacilli an experiment was instituted in which small collodion-impregnated silk bags containing virulent bovine tubercle bacilli were placed in the peritoneal cavities of normal and tuberculous rabbits. These bags effectively barred the entrance of any cells, but still permitted exposure of the bacilli to the body fluids. The growth of the bacilli in the bags placed in tuberculous rabbits was found to be markedly inhibited whereas an extensive multiplication of the bacilli occurred in the normal animals. Histological examination showed that the contents of the bags remained absolutely cell free. The body fluids *per se* of a tuberculous animal are bacteriostatic for tubercle bacilli. It is clear that allergic inflammation in the highly sensitized guinea pig mechanically and in other ways hinders the spread of tubercle bacilli from the site of reinfection. The difference in rapidity of spread in guinea pigs and rabbits seems to be correlated with the degree of allergy developed by these two types of animals. That the response in the guinea pig is mechanical as well as specific is suggested by the fact that entirely unrelated substances such as trypan blue and agar particles are more effectively localized at the site of reinfection in the guinea pig than in the rabbit.—*Studies on the Mechanism of Immunity in Tuberculosis. The Role of Extracellular Factors and Local Immunity in the Fixation and Inhibition and Growth of Tubercle Bacilli, M. B. Lurie, J. Exper. Med., April 1, 1939, lxix, 555.—(J. S. W.)*

Phagocytes in Tuberculosis.—In a previous study it was concluded that the most significant factor in the mechanism of immunity to tuberculosis is the rapid mobilization of mononuclear phagocytes with an increased physiological capacity to destroy or inhibit the growth of tubercle bacilli; the more rapid formation of epithelioid tubercles and their ready resolution were attributed to these factors. In the present study some of these phenomena are examined. It has been shown that if the site of infection exhibits an acid reaction, the mononuclears will predominate in the inflamed area. If the site of tuberculous reinfection regularly shows a more acid reaction than the site of primary infection, this difference in pH might be a factor in the more rapid mobilization of the mononuclears in immune animals. To study this, the pH of subcutaneous agar foci with and without tubercle bacilli was investigated in normal and tuberculous rabbits and normal and vaccinated guinea pigs. All the sensitized (immune) animals showed a slightly lower pH at the inflammatory site in comparison with normal animals. The difference, however, was only about 0.2 pH. The intrapleural injection of aleuronot-starch, a nonspecific irritant, also resulted in a slightly lower pH of the exudate of the sensitized animals as compared with the normal guinea pigs. But when this substance was injected into rabbits, there was not a corresponding fall of the pH in the immune animal. However, the immune animal showed an accelerated mobilization of mononuclears.

It is difficult to attribute the rapid arrival of the mononuclears in the sensitized animals to the pH of the exudate. Groups of normal, and actively tuberculous and R1-vaccinated guinea pigs were injected intrapleurally with a mixture of aleuronot-starch and india ink. Both the tuberculous and vaccinated animals responded with a greater percentage of mononuclears than the normal animals, with a larger percentage of mononuclears phagocyting carbon particles and with more carbon particles per cell in the exudate. Also the number of binucleated and multinucleated cells was greater in the exudates from the sensitized animals. This tendency for division on the part of the mononuclears of an immune animal may account in part for the more rapid mobilization of these cells. Carbon introduced into the tissues of tuberculous animals agglutinates to a greater degree than in the normal animal. To eliminate this possible advantage to sensitized animals in the matter of phagocytosis, experiments were done *in vitro* with cells washed free of their body fluids. Mononuclear cells were obtained from normal, actively tuberculous and vaccinated guinea pigs and treated with sera both normal and immune plus a given amount of india ink. The phagocytic capacity of the cells derived from the sensitive animals for carbon particles was, in the majority of instances, significantly greater than that of the cells of normal origin. However, the cells from the vaccinated animals showed this superiority to a lesser degree. On repeating these experiments, using staphylococci and collodion particles instead of carbon, similar results were obtained. It is evident that mononuclear cells derived from actively tuberculous and vaccinated animals will ingest more unrelated particles than mononuclear cells from normal animals independent of the presence of normal or immune serum. When virulent tubercle bacilli were used as the particles for phagocytosis, the monocytes from actively tuberculous animals again showed an enhancement of their phagocytic powers. The cells from the vaccinated animals, however, manifested only a doubtful advantage over cells of normal origin. Tuberculosis, apparently, confers upon the mononuclear cells an increased capacity to divide in response to irritation and a capacity to ingest a greater amount of particles available for phagocytosis, whether these be nonspecific substances or tubercle bacilli. Mononuclear cells from vaccinated animals show only a very slight enhancement of phagocytic activity for tubercle bacilli, which parallels the well known fact that active tuberculosis confers a greater relative immunity than vaccination with an organism of low virulence. The acceleration of mobilization which occurs in the sensitized animals irrespective of the irritant suggests that a heightened physiological activity has been conferred on these animals. The increased rate of division exhibited by the sensitized mononuclears may be a significant factor in their more rapid mobilization. The *in vitro* studies clearly indicate that the sensitized mononuclears possess an increased ability to ingest foreign particles and tubercle bacilli. Immunity may be an expression of the enhanced activity on the part of the mesenchymal cells as demonstrated in this study.—*Studies on the Mechanism of Immunity in Tuberculosis. The Mobilization of Mononuclear Phagocytes in Normal and Immunized Animals and Their Relative Capacities for Division and Phagocytosis, M. B. Lurie, J. Exper. Med., April 1, 1939, lxix, 579.*—(*J. S. W.*)

Protective Value of Heat-Killed Tubercle Bacilli.—The value of heat-killed tubercle bacilli in protecting against tuberculosis was determined by vaccinating 210 patients in the Mental Hospital, Kingston, Jamaica, B. W. I., who failed to react to the intracutaneous injection of 1.0 mg. of Old Tuberculin. Two hundred and six patients who were also tuberculin-negative and inmates of the same institution served as controls. The original method of vaccinating by injecting intracutaneously from 5 to 10 doses of 0.1 mg. of heat-killed bacilli until the tuberculin reaction became positive was subsequently modified to the single injection of 0.2 mg. followed seven weeks later by a tuberculin test. A second injection of the vaccine was made, if the test remained negative. The vaccinated and control cases were tuberculin tested and X-rayed shortly after their admission to the hospital and at intervals of from three to four months. Within three months after admission 72 per cent of the vaccinated and 36 per cent of the unvaccinated control group reacted to the intracutaneous injection of Old Tuberculin. The percentage of those who reacted gradually increased until at thirty-three months after admission to the hospital 83 and 72 per cent of the control and vaccinated group, respectively, reacted to tuberculin. During the six-year period of observation manifest tuberculosis was found in 23, or 10.5 per cent, of the vaccinated and in 39, or 19 per cent, of the control group, while death from this disease occurred in 16, or 7.6 per cent, of the vaccinated and 27, or 13.1 per cent, of the control group. The ratio of death to cases was 69.6 and 69.2 per cent for the vaccinated and control

group, respectively. The authors conclude that the intracutaneous injection of heat-killed tubercle bacilli appreciably lowers the tuberculosis morbidity and mortality rates for at least eighteen months following vaccination.—*Protective Inoculation against Human Tuberculosis with Heat-Killed Tubercle Bacilli, E. L. Opie, W. Flahiff & H. H. Smith, Am. J. Hyg., May, 1939, xxix, 155.*—(*J. D. A.*)

BCG Vaccination.—The Swedish National Association against Tuberculosis has since 1927 supported an intensive program of BCG vaccination in the province of Norrbotten. The tuberculosis death rate in this region was high (over 300 deaths per hundred thousand inhabitants in 1924 and 1925) and was not declining. Vaccination was performed in the first ten days of life by the oral route. In ten years there were 47,948 births in the province; in 13,013 (almost 30 per cent) vaccination was requested. The percentage vaccinated varied from year to year, falling sharply for several years following the Lübeck disaster. No selection was practiced, but it is probable that vaccination was more common in families with known tuberculosis. On the other hand, comparison of the total mortality in the vaccinated and nonvaccinated groups showed in the former group a diminishing fatality rate, suggesting perhaps that families providing better nutrition and a superior environment were more likely to have their infants vaccinated with BCG. The tuberculosis death rate in the nonvaccinated group was more than four times that of the rate in the vaccinated children. The difference was most striking in the death rates for the first two years of life, but at each age death from tuberculosis was more common in the nonvaccinated group. The results reported are considered sufficiently satisfactory to warrant wider use of this vaccine.—*Un essai de dix ans de vaccination BCG dans le Norrbotten, C. Naeslund, Rev. de la tuberc., June, 1939, v, 710.*—(*H. L. I.*)

Immunization against Avian Tubercle Bacilli.—Intravenous inoculations of 0.1 to 1.0 mg. of virulent avian tubercle bacilli produce in rabbits or guinea pigs a toxic infection rapidly fatal, called the Yersin type of toxic infection. Autopsies of these animals reveal, in the majority of cases, an absence of nodular lesions. In cases where visible lesions are present they are for the most part of an ordinary toxic character, notably in the lungs and kidneys. Avian tubercle bacilli distinguish themselves from other types of tubercle bacilli by the faculty which they possess of producing lesions of a toxic nature. Results have previously been published showing that animals treated with dead avian tubercle bacilli either succumbed rapidly to an experimental infection or on the contrary effected a recovery, giving the impression of a definite immunization. Further experimentation was carried out in an attempt to show the interlacing mechanism of this hypersensitivity to inoculations of virulent bacilli and of the immunity in rabbits vaccinated by injections of heat-killed avian tubercle bacilli. Thirty-six rabbits were given intravenous inoculations of a total of 1.0 mg. of heat-killed avian tubercle bacilli in varying doses at varying intervals, from a single inoculation to inoculations up to five days. Fourteen rabbits were used as control animals. Among the treated animals 10 died of intercurrent infections and 23 were given intravenous doses of 0.1 mg. of living virulent avian tubercle bacilli after an interval varying from five days to seventy-three days after the injection of dead bacilli. The remaining 3 animals received their infecting inoculations two hundred and six days after the vaccinating injections. Among the controls receiving the same infecting dose, 7 died of secondary infections and 7 died of the Yersin type of tuberculosis. Among the 26 vaccinated and infected rabbits, 4 died with the toxic-infection type of tuberculosis, with typical lesions, macroscopically and histologically analogous to the lesions in the control animals. Eight more animals died after the usual delay in tuberculosis of the common Yersin type. Three animals survived for periods up to one hundred and fifty-eight days following the experimental infection. One did not become infected at all. In general the period of survival augmented with the length of the interval between the immunization and the time of the experimental infection. With but one exception not a single case of fatal tuberculosis of the Yersin type was observed in the rabbits infected later than fifty-six days following their immunizing injections. Those animals which survived for a long time did not show the characteristic lesions of Yersin tuberculosis, but had macroscopical lesions more or less numerous in the lungs and kidneys and 6 of them had tuberculous arthritis involving the synovia and with cold abscesses around certain joints. The surviving rabbit had a tumefaction of the paw, tuberculous in nature. It was thought that two factors of pathogenicity of this Yersin type of tuberculosis might be distinguished—a "toxic" factor and a "virulence" factor for the allergic organism. The rare specific lesions in the experimental animals were attributed to the "virulence" factor, the common

toxic lesion to the "toxic" factor. It appeared that the further removed the infecting inoculation was from the immunizing injection the rarer became the fatal toxic infection and the more frequent nodular foci or arthritis. Inoculations of dead avian tubercle bacilli appeared to have acted in the sense of an allergization followed by a desensitization rather than in a manner of a true immunization. These results hold only for tubercle bacilli of the avian type and not for tubercle bacilli of human or bovine strains.—*Nouvelles expériences de prémunition de lapins vis-a-vis de bacilles tuberculeux aviaires, au moyen de bacilles homologues, tués par chauffrage, F. van Deinse, Compt. rend. Soc. de biol., November 19, 1938, cxxix, 649.*—(*M. T. W.*)

Experimental Immunity.—Primary infections were produced in guinea pigs by subcutaneous injections of either mild or virulent tubercle bacilli. Five weeks later the animals were reinfected with virulent bacilli and were autopsied a few days to eight months after reinfection. When the primary infection was mild and confined to the site of inoculation and the corresponding lymph nodes, an immunity developed within a few weeks. In these immune animals, reinfecting virulent bacilli produced tuberculous foci in the liver, kidneys, lungs and spleen, but after a time the bacilli died and the foci healed. When, however, the initial infection was produced by virulent bacilli, a generalized tuberculosis developed, and reinfection produced progressive organ tuberculosis. From these experiments, the authors conclude that only in the presence of dormant tuberculosis can an effective immunity be expected.—*Nachweis und Auswirkung der Tuberkulose-Immunität bei Meerschweinchen, H. Selter & A. Nagel, Ztschr. f. Tuberk., November, 1938, lxxxi, 129.*—(*A. B. C.*)

Active Immunization in Tuberculosis.—Anticipating the favorable effect that lupus has on pulmonary tuberculosis clinically, artificial lupus was produced in 40 patients by one or more injections of virulent tubercle bacilli, according to the method of Kutschera. In no instance was this therapy undertaken as a substitute for collapse therapy. No unfavorable reactions were observed. By means of the Meinicke reaction the authors were able to demonstrate serologically favorable quantitative changes in the patients thus treated.—*Zur Frage der aktiven Immunisierung bei Lungentuberkulose, W. Berdel & E. Sander, München. med. Wchnschr., March 3, 1939, lxxxvi, 341.*—(*A. B. C.*)

Allergy and Immunity.—Tuberculin hypersensitiveness and acquired resistance to tuberculosis are dissociable phenomena. Dissemination of virulent tubercle bacilli through the lymphatic, venous and systemic circulation and viscera is significantly more delayed in the completely desensitized (iathergic) than in the allergic hypersensitive organism. Inoculation of virulent tubercle bacilli in the allergic hypersensitive organism induces generalized, invasive and caseo-necrotic tuberculous lesions rich in tubercle bacilli. Similar inoculation in the desensitized organism induces circumscribed and noninvasive tubercles containing few tubercle bacilli. Abolition of allergic hypersensitiveness by careful tuberculin desensitization leaves the mechanism of acquired tuberculo-resistance intact, and significantly protects the body against active and invasive disease.—*Allergy and Immunity (Iathergy) in Experimental Tuberculosis. III. Degree of Tuberculosis in BCG-Immunized Guinea-Pigs Reinfected in the Allergic and Desensitized (Iathergic) State, K. Birkhaug, Acta. tuberc. Scandinav., Fasc. 1-2, 1939, xiii, 163.*—(*F. B. S.*)

Allergy and Hormones.—In previous work it was shown that allergic reactivity in cases of chronic arthritis may be definitely increased by thyreotropic hormone, thyroid extract and ovarian preparations. Reactivity was tested by the use of Old Tuberculin in varying dilutions. By the use of the above hormones, tuberculin reactivity was increased in almost 100 per cent of 30 arthritics and in 6 normals. In these same groups of cases, changes in tuberculin reactivity were determined after the injection of progynon in females and testoviron in males. Injection of these hormones into the opposite sex apparently has very little effect on tuberculin reactivity. After two injections each of 25 mg. of testoviron or 50,000 units of progynon, a definite increase in skin reactivity was noted; the greatest increase occurred after three injections. The hormones were administered either daily or every two days. The maximum increase obtained was from a dilution of 1:100 to a dilution of 1:100,000 after three injections. In a number of patients the increase was much less marked. In only one case, an old man with severe heart failure, was there no appreciable effect. In several cases a moderate increase (from 1:1,000 to 1:10,000) was produced after giving the hormones by mouth. In subjects with dermographia a definite decrease in the latent period and an increase in erythema was brought about by the use of these hormones. These observations may have some therapeutic value,

particularly in certain patients with chronic disease, such as arthritis and tuberculosis, where a stimulating effect is desired.—*Steigerung der allergischen Reaktionslage durch Hormone, A. Sylla, Klin. Wchnschr., March 4, 1939, xviii, 311.*—(*H. R. N.*)

Desensitization of Tuberculous Guinea Pigs.—Four series of experiments were conducted to determine the effect of desensitizing treatment on tuberculous guinea pigs. Desensitization was attempted with several different antigens as described. SMT, TPT and PPD are efficient desensitizing antigens, TPT being slightly better than PPD. Daily doses are more effective than weekly ones. The virulent H37 strain causes too rapid progression of the disease to show any effects from desensitization. Another strain, H178, producing a slowly progressive infection, allows differences in extent of disease to be demonstrated. Guinea pigs infected with this strain and treated with TPT and PPD show fewer lesions and less spread than untreated animals. Desensitization treatment produced no adverse effects on the animals. Desensitization was never complete. The systemic test was found to give a more accurate indication of sensitiveness than the skin test. The better effects with TPT may be due to the fact that it is a more specific, unheated antigen.—*Desensitization in the Treatment of Tuberculous Guinea Pigs, J. D. Thayer, Tubercle, May, 1938, xix, 165.*—(*A. P.*)

Anachoresis in Tuberculosis.—It has been shown in a guinea pig that extirpation of a testicle previously injected with virulent tubercle bacilli causes a more rapid and more unfavorable course of the disease. The "anchoresis theory" claims that this progression or generalization is caused by the abolition of the attenuating influences exerted by the primary focus. The same protective power would be produced by an inoculation pustule. It has been demonstrated in experiments on calves that, through removal of the BCG inoculation pustule, the increase of resistance produced with BCG is lost again. Another attempt to prove this theory was made recently. Inoculation pustules were transplanted from one calf to another. The vaccine, used for this purpose, was made of an attenuated bovine strain " IV A" which proved to be a little less attenuated than BCG. In two calves nine days old inoculation pustules were successfully transplanted. Forty-one days later 0.1 mg. of virulent bovine tubercle bacilli was administered intravenously. The autopsy of these two calves revealed no tuberculous lesions. In a control calf miliary tuberculosis of the lung could be demonstrated.—*Welche Rolle spielt die Anachorese bei der Tuberkulose Immunität?, A. Ascoli, Schweiz. med. Wchnschr., March 25, 1939, xii, 241.*—(*A. B. T.*)

Tuberculin Test.—The quantitative factor, or the measure of the degree of hypersensitivity to tuberculin, has been greatly neglected. By administration of a series of graded dilutions, it should be possible to establish a point above which reactions can be obtained only in those who possess a considerable degree of hypersensitivity, that is, persons actively combating tuberculous disease. A total of 505 young adults were used; about 95 per cent were between twenty and thirty years of age. They were composed, for the most part, of nurses, internes and attendants. Forty-three had active pulmonary tuberculosis and the remainder were healthy subjects. The chest roentgenograms of the entire group fell into three divisions: completely negative, large irregular calcifications in hilum, parenchyma or both and signs of activity. Mantoux tests were then performed, using dilutions from 1:1,000 to 1:100,000. Induration was considered the most important criterion of a positive reaction; erythema alone is unreliable. In group I, a total of 210 persons, 62.4 per cent gave a negative reaction to the 1:1,000 dilution; with the 1:5,000 dilution 80.4 per cent gave a negative reaction; with the 1:10,000 dilution, 83.8 per cent gave a negative reaction and with the 1:100,000 dilution, 96.7 per cent reacted negatively. In group II, 20 subjects, 45 per cent gave a negative reaction to the 1:1,000 dilution; with the 1:5,000 dilution, 60 per cent reacted negatively; with the 1:10,000 dilution, 71.5 per cent reacted negatively and with the 1:100,000 dilution, 20 reacted negatively and none had a positive reaction. In group III, 43 patients, only 2 were tested with the 1:1,000 and the 1:5,000 dilutions and both were positive. With the 1:10,000 and the 1:100,000 dilutions, 94.8 per cent gave a positive reaction. With the 1:1,000 and 1:5,000 dilutions of Old Tuberculin, there seems to be no correlation between the cutaneous reaction and the roentgen findings of the chests of young adults sufficient to be of any value in estimating the past or present activity of tuberculous infection in the lungs. Response to a dilution of 1:100,000 may usually be considered indicative of active tuberculosis, and response to the 1:10,000 and not to the 1:100,000 dilution seems to indicate latent or healed tuberculosis. The majority of patients with active disease had a minimal exudative type of tuberculosis. The cutaneous reactions in

the active group were usually larger than in the other groups, and none measured less than 10 by 10 mm. The accuracy of the quantitative intracutaneous tuberculin test, when properly performed, is comparable to that of the commonly accepted immunological and serological procedures.—*Roentgenograms of the Chest and the Intracutaneous Tuberculin Test for Adults, L. W. Hunt, Arch. Int. Med., July, 1939, lxiv, 49.—(H. R. N.)*

Tuberculin Tests.—Positive reactors among medical and dental students, 35 in number, were retested with intracutaneous tuberculin, 0.1 cc. of a 1:10,000 solution (0.01 mg.), at intervals of one, two, three, four and six weeks. Supersensitization occurred when retesting was done within two weeks of the original test. With subsequent retesting, gradual desensitization appeared to occur, but unexplained and unexpected variations in tuberculin sensitivity were observed in many cases. Some observers have attempted to correlate variations in tuberculin sensitivity with the state of the cutaneous circulation, others with the season of the year. In the present investigation, however, there was no apparent seasonal variation in tuberculin sensitivity. Since variations in tuberculin sensitivity in normal individuals have been demonstrated in this investigation the author suggests that caution should be used in evaluating the prognostic significance of the variations of tuberculin sensitivity in patients with active tuberculosis.—*Repeated Tuberculin Tests, J. R. Forbes, Guy's Hosp. Rep., October, 1938, lxxxviii, 490.—(A. B. C.)*

Tuberculin Test.—Intracutaneous tests with 0.000,5 mg. PPD were given to 3,900 school children, aged five to nineteen years, in Giles County, Tennessee, a rural area with a high death rate from tuberculosis, and Coffee County, Alabama, a comparable area with a low tuberculosis death rate. The percentage of reactors among white children was 13.8 in Giles County, and 14.9 in Coffee County. Among Negro children 22.4 per cent were positive in Giles County and 19.5 per cent were positive in Coffee County. The surprisingly low percentage of positive reactions, as well as the lack of correlation with the death rate, suggested a deficiency in the test material. Additional tests were performed in duplicate, comparing the results with preparations of PPD and OT supplied by two manufacturers. The variation in results was marked, the percentage positive ranging from 11.8 to 78.6 with different preparations. X-ray examination of the 3,900 children tested showed calcified primary lesions in over 40 per cent of white children in Giles County, and less than 1 per cent in white children in Coffee County. A similar but less marked difference was noted in Negro children. Clinically significant infiltrations were also much more frequent in the children of Giles County. The incidence of calcified lesions as well as clinically significant infiltrations was equally high in children reacting to 0.000,5 mg. PPD and in those failing to react. X-ray examination of a small group tested with 0.1 mg. OT showed calcified lesions equally frequent in reactors and non-reactors. The authors conclude that skin testing with any of the tuberculin preparations now on the market is of questionable value as an index to the tuberculous infection of a community. Further work on standardization of materials is urged, with attention as well to the methods of administration and interpretation of the test.—*Questionable Value of Skin Testing as a Means of Establishing an Epidemiological Index of Tuberculous Infection, L. L. Lumsden, W. P. Dearing & R. A. Brown, Am. J. Pub. Health, January, 1939, xxix, 25.—(H. L. I.)*

Tuberculin Patch Test.—A comparative study of the tuberculin patch test and the Mantoux test has been carried out on 678 children. Among 417 children admitted to the wards of the Mount Sinai Hospital, the reliability of the tuberculin patch test as compared with the Mantoux test performed with 0.1 mg. of Old Tuberculin was 100 per cent. Two hundred and sixty-one tuberculous children of the Sea View Hospital showed 100 per cent conformity between the tuberculin patch test and the Mantoux test with first strength solution of PPD or 0.01 to 1 mg. of Old Tuberculin.—*Evaluation of the Tuberculin Patch Test (Vollmer-Lederle), H. Vollmer & Esther W. Goldberger, Am. J. Dis. Child., June, 1939, lvii, 1272.—(M. B.)*

Tuberculin Patch Test.—Patch tests were done on 257 unselected patients admitted to the pediatric service of Harlem Hospital. Over 90 per cent of the patients were Negroes. It is concluded that the patch test is about as satisfactory as the Pirquet test in routine tuberculin testing. In this series the patch test detected 95 per cent of those found to react to 0.1 mg. applied by the Mantoux method. Two children gave positive patch tests without evidence of pulmonary tuberculosis; these children had negative Mantoux tests. It was thought that these were false patch reactions. With this reservation in mind,

the belief is expressed that the patch test is a satisfactory tuberculin test for general use.—*Tuberculin Patch Test. A Comparison with the Pirquet and Mantoux Tests, S. B. Weiner & A. Neustadt, J. Pediat., June, 1939, xiv, 752.*—(*M. B.*)

Tuberculin Patch Test.—Eight hundred and eighty tuberculin tests were done on school children comparing the Vollmer patch test with the PPD intracutaneous test. The patch test was found positive in only 30 per cent of the cases positive to PPD, I or II. It is believed that a negative patch test does not by any means eliminate the possibility of a positive reaction to tuberculin and that the patch test alone is unsuitable as a screening method for finding the tuberculin reactors in a school population.—*Comparison of the Vollmer Tuberculin Patch Test with Purified Protein Derivative, E. C. Peck & M. E. Wegman, J. Pediat., August, 1939, xv, 219. (Authors' Summary)* —(*M. B.*)

Negative Tuberculin Test in Tuberculous Patients.—Four cases are cited in which clinical tuberculosis was accompanied by negative Pirquet or Mantoux tests. The diagnosis was proved in one adult and in one child by demonstration of tubercle bacilli. In a child with a chronic pulmonary lesion and in a child with cervical adenitis the clinical course seemed sufficiently typical to warrant a diagnosis of tuberculosis. Further study was made of a group of 99 children who failed to react to the Pirquet test, and who either gave history of contact or showed evidence of calcified pulmonary lesions. The intracutaneous tuberculin test was negative in 77 of this group. The frequent association of calcification with history of familial contact led the authors to believe that many of these children had been infected with tubercle bacilli, despite the present negative tuberculin reaction. Similar evidence of past infection was observed in a group of 15 tuberculin-negative adults. The authors conclude that progressive clinical tuberculosis is rarely accompanied by a negative reaction, while loss of sensitivity in benign cases is by no means uncommon.—*Les réactions tuberculiniques négatives chez les sujets infectés par le bacille tuberculeux, E. Couland & Lemanissier, Rev. de la tuberc., July, 1939, v, 806.* —(*H. L. I.*)

Tuberculin Test.—The development of tuberculosis in those who failed to react to tuberculin and in those who had a positive tuberculin reaction was studied at the Mental Hospital, Kingston, Jamaica, during the period 1932 to 1938. Intracutaneous tests with 0.01 and 1.0 mg. of Old Tuberculin and X-ray examination were carried out within one month after admission to the hospital. Of the 1,295 persons who reacted to 0.01 mg. of Old Tuberculin upon admission, 50 developed tuberculosis during the period of observation and 39 died of this disease. Among the 454 persons who reacted to 1.0 mg. of Old Tuberculin 42 developed tuberculosis, 33 of whom died, while among the 206 cases who failed to react to tuberculin 39 developed tuberculosis and 27 of these died. Among those who reacted to 0.01 mg. of tuberculin the tuberculosis rate was at its maximum of 2.3 per cent within the first six months following admission. Among those who reacted to 1.0 mg. the rate rose from 2.4 per cent, observed during the first six months, to 4.4 per cent, remaining at approximately this level for two years, when the rate approximated that of those who reacted to 0.01 mg. Among those who failed to react to tuberculin a peak of 11.1 per cent clinical tuberculosis occurred within the first six months after admission, and throughout the period of observation the percentage who developed tuberculosis was conspicuously higher in this group than that observed among those who reacted to tuberculin. The death rate among those who reacted to 0.01 mg. of Old Tuberculin ran a fairly even rate during the period of observation, being 0.8 per cent six months after admission, and reaching a maximum of 2.1 per cent thirty to thirty-five months after admission. The group that reacted to 1.0 mg. of tuberculin had a mortality of 1.3 per cent six months after admission, and twenty-four to twenty-nine months after admission the peak of 5.7 per cent was reached. Among those who failed to react to tuberculin on admission, the mortality was higher, being 3.0 per cent six months after admission, and reaching a peak of 9.2 per cent eighteen to twenty-three months after admission. The author concludes that the rate of onset and death rate from tuberculosis were highest among those who failed to react to tuberculin, less among those who reacted to 1.0 mg. of tuberculin and least among those who reacted to 0.01 mg.—*The Occurrence of Tuberculosis in Persons Who Failed to React to Tuberculin and in Persons with Positive Tuberculin Reaction, E. W. Flahiff, Am. J. Hyg., September, 1939, xxx, 69.*—(*J. D. A.*)

Positive Mantoux Test and Immunity.—A systematic study in regard to pulmonary tuberculosis over a three-year period was made on 1,596 or 87 per cent of the medical

students at the University of Copenhagen. They were tested intracutaneously with tuberculin (up to 1 mg.) and those showing positive reactions were X-rayed. The positive reactors were periodically checked with the X-ray, and the negative reactors with the tuberculin test. When the latter became positive they were thoroughly examined and then followed with periodic X-ray examinations. Of 1,180 students with positive tuberculin reactions, 19 showed evidence of tuberculosis by means of roentgen rays and, of these, 12 contracted active pulmonary tuberculosis during the period of investigation. Of 416 students with negative tuberculin reaction at first, 109 gave a positive reaction at a later date (27 after BCG vaccination and 82 as a result of spontaneous infection). Of the 82 individuals, 19 developed symptoms of pulmonary tuberculosis during the period of observation. The speed of contagion is greater among medical students than among other students.—*La Réaction positive de Mantoux chez l'adulte est-elle la manifestation d'une immunité contre la tuberculose?, J. Holm & P. Helweg-Larsen, Acta. tuberc. Scandinav., Fasc. 4, 1938, xii, 373.*—(*F. B. S.*)

Anamnestic Tuberculin Test.—By anamnestic reaction of tuberculin is meant the reawakening of a dormant tuberculin allergy. Four hundred seventy-three Negroes, aged sixteen to twenty-five years, were tested with freshly prepared PPD, one-tenth of the second strength being used. The tests were read at forty-eight hours, and 370, or 78 per cent, were found positive. The 103 individuals who failed to react were immediately tested again with the same strength of PPD at a distance of at least four inches from the original test, and 23 persons gave positive tests forty-eight hours later. Since there was no increase in the strength of the solution used for the second test, it is concluded that the first test caused an awakening of a dormant tuberculin allergy.—*Anamnestic Reaction of Tuberculin: Preliminary Report, J. B. Novak & J. S. Kruglick, Am. J. Dis. Child., March, 1939, lvii, 570.*—(*M. B.*)

Effect of Ascorbic Acid on Tuberculin Reaction.—Daily oral administration of crystalline vitamin C significantly inhibits the tuberculin reaction in tuberculous guinea pigs. The degree of inhibition of the tuberculin reaction is definitely correlated with the urinary excretion and suprarenal content of vitamin C in the tuberculous animal and increases with time.—*The Role of Vitamin C in the Pathogenesis of Tuberculosis in the Guinea Pig. IV. Effect of l-Ascorbic Acid on the Tuberculin Reaction in Tuberculous Animals, K. E. Birkhaug, Acta tuberc. Scandinav., Fasc. 1–2, 1939, xiii, 45.*—(*F. B. S.*)

Tuberculin Reaction in Guinea Pigs.—In an infected animal, the extent of the focal reaction following injection of tuberculin will depend upon the actual amount of tuberculous tissue that is present. When numerous tuberculous foci are present, the systemic effect of the focal reactions may be so severe as to result in death. Avirulent organisms, such as BCG, do not produce severe organic changes. Previous work has shown that it is extremely difficult or impossible to produce tuberculin death in animals vaccinated with BCG even with large doses of tuberculin administered intravenously or intraperitoneally. Tuberculin death occurs several hours after the injection of the tuberculin and must not be confused with tuberculin protein anaphylaxis. Killed tubercle bacilli produce tuberculin allergy, but this is neither constant nor of long duration. By combining the dead bacilli with some substance which prevents rapid absorption, such as lanolin or vaseline, the resulting allergy may be heightened and its duration increased. Experimental work was carried out with three groups of animals: 6 guinea pigs with wide-spread tuberculosis, 6 guinea pigs in which a high grade cutaneous tuberculin sensitivity had been produced by the subcutaneous injection of 0.000,5 g. of dead bacilli embedded in vaseline or lanolin, and 2 entirely normal guinea pigs. Fourteen days before the intraperitoneal injection of tuberculin, all these animals were skin tested with 0.1 cc. of a 1:5 dilution of Old Tuberculin. The animals in group one showed only a mild skin reaction while the animals in group two showed a severe reaction. No skin reaction was obtained in the control animals; 0.1 cc. of Old Tuberculin was then administered intraperitoneally to all three groups. In the first group all 6 shortly became increasingly ill; 4 died within twenty-eight hours and the other 2 were killed after three days. At autopsy all 6 showed wide-spread tuberculosis with marked focal reaction, pleural effusion, ascites and definite dilatation of the visible blood vessels. There was no apparent effect upon the 6 animals in group two; autopsy on 2 of these, killed after three days, showed no abnormality except for some dilated vessels in the area of vaccination. There was no apparent effect on the control animals.—*Verhalten tuberkulinempfindlicher nicht tuberkulöser Meerschweinchen gegenüber*

intraperitonealer Tuberkulininjektion, G. Hensel, Klin. Wchnschr., May 20, 1939, xviii, 708.—(H. R. N.)

Old Tuberculin and Purified Tuberculin.—At present two methods of standardization are available, the shock and the intracutaneous method. Each has advantages and disadvantages. The shock method was introduced by Robert Koch (1890) and subsequently modified by a number of workers. It consists of the injection of decreasing doses, usually three, of the standard tuberculin and the one to be assayed, into a series of guinea pigs infected with tubercle bacilli about five weeks previously. A comparison of the mortality curve gives the proportional strength of the two. However, a serviceable standardization requires at least 10 animals per dose, a total of 60, and these, in turn, must be picked from a larger group, so that probably about 100 in all must be available. Moreover, the shock effect and intracutaneous effect are not necessarily parallel. The intracutaneous method is more recent, being developed among others, by Eagleton and Baxter (1923), Löwenstein, Watanabe and Kavamura (1929) and others. It allows comparison of the strength of two tuberculins on the same animal or person. The method consists of intracutaneous injection of decreasing doses of standard tuberculin and that to be tested into symmetrical spots on the same animal or person. Holm, who has largely used this method, applies the test to the dorsal surface of the forearms and is careful to select doses within the limits where the least difference in amount gives the greatest difference in reactions. Using one person his mean error was 14 per cent, using 4 about 5 per cent. The State Serum Institute at Copenhagen has used it exclusively for standardizing tuberculin during the last few years. The tests, however, must be applied to fields of uniform sensitivity. In the guinea pig several places are available but in man, for practical purposes, the tests are limited to the skin of the forearms and the reacting power varies even with different parts of the forearm. Holm finds it highest toward the wrist, lowest near the elbow. Because of the variation in character of the individual reactions Jensen and coworkers have given up standardization by tuberculin sensitivity curves and limit themselves to a direct comparison between reactions. There are qualitative, as well as quantitative differences not only between different tuberculins, but between the reactions from purified tuberculin and those from international standard tuberculin. It seems that it will be necessary to have a "purified standard tuberculin" in addition to an "international standard Old Tuberculin." Among other phenomena observed, it was noted that two tuberculins (T2779 and E1103) elicited relatively transient reactions, whereas that from standard tuberculin persists at least three days. Intracutaneous standardizing on human subjects is always preceded by preliminary testing on guinea pigs, making it practicable to inject the two tuberculins in adjusted doses. It is emphasized that the degree of experimental error obtained by the trained examiner applies to his work alone and cannot be transferred as applying to the method in general. Holm found in 1934 that a dilution containing 0.01 mg. per 0.1 cc. in 0.5 per cent phenol-saline attenuated 50 per cent in fourteen days. When, however, C. Jensen used a buffer solution to which was added 0.5 per cent phenol, a month old solution elicited even stronger reactions than the fresh solution. Storage of the dilution with phenol-buffer for one month does not measurably impair its activity. Using quinosol in place of phenol, it was found possible to keep these dilutions two months or more.—*Old Tuberculin and Purified Tuberculin. Standardization. Preparation of Stable Solutions, K. A. Jensen, G. Bindslev, S. Möller, A. Hansen & R. Lind, Tubercle, June, 1938, xix, 385. (Continued)*—*(A. P.)*

Old Tuberculin and Purified Tuberculin.—In order to simplify the Mantoux test studies have been carried out in connection with the stability of the three dilutions of Old Tuberculin previously employed. By diluting in a buffer solution pH 7.38 with addition of 0.01 per cent quinosol, the weakest dilution (.01 mg. per 0.1 cc.) keeps well for about two months. A purified tuberculin, prepared on the principles of Seibert, will dissolve as a clear solution in such a diluent. Its standardization by the usually employed intracutaneous method in relation to International Standard Tuberculin is not practicable but comparison by other methods has shown that dosage is comparable. In Denmark the two doses of .000,5 mg. and .05 mg. have been extensively used in serial investigation without serious inconvenience. Prepared dilutions in a buffered solution are stable for about a month. To supply regularly the hospitals in Denmark will mean a yearly consumption of 1 to 2 g. purified tuberculin. The following advantages are cited: inexpensiveness, uniformity of material, avoidance of mistakes in preparation.—*Old Tuberculin and Purified Tuberculin. Standardization. Preparation of Stable Solution. II. Purified Tuberculin, K. A. Jensen, G. Bindslev, S. Möller, A. Hansen &*

P. Lind, Tubercle, July, 1938, xix, 433.—(A. P.)

OT and PPD.—On the basis of skin tests on tuberculous guinea pigs the author found that OT and PPD were comparable in the ratio of 100 to 1 by weight and that 0.000,1 mg. of PPD was equivalent in potency to 0.01 mg. of the League of Nations standard tuberculin. Comparative tests with OT and PPD on a small group of students indicated that the percentage of reactors to both tuberculins was approximately the same and that therefore epidemiological data previously obtained with OT were valid. The reactive substance present in OT and PPD was determined on tuberculous guinea pigs. It was found that in the higher concentrations OT produced larger reactions while in the lower concentrations PPD elicited larger reactions. In man and in tuberculous guinea pigs, PPD was found to have a greater reactive capacity in dilutions of 1:10,000 to 1:50,000 than did OT dilutions of 1:100, and 1:1,000 of OT brought about more severe reactions than comparable doses of PPD. It was found that 1:1,000 dilutions of OT and PPD showed no loss of potency when stored for four days at incubator temperature. Dilutions of 1:10,000 and 1:50,000 stored for eleven to eighteen days at room or ice box temperature showed no loss of potency when tested on patients; in fact stored diluted samples of PPD gave, on the whole, larger reactions than fresh dilutions. The author concludes that OT is as specific as PPD, in relationship to roentgenologically demonstrable lesions of tuberculosis. Neither OT nor PPD has been found to sensitize normal guinea pigs. PPD is more specific as evidenced by the fact that reactions were obtained in the higher dilutions. Heteroallergic reactions may be produced by OT due to the presence of extraneous nonspecific substances, which may be present in the culture medium, or of metabolites of the tubercle bacillus.—*A Comparative Study of Old Tuberculin and the Purified Protein Derivative, R. M. Seideman, Am. J. Hyg., July, 1939, xxx, 1.—(J. D. A.)*

Tuberculoprotein.—In further animal inoculation studies with pure tuberculoprotein, with the purpose of producing hypersensitiveness and correlating it with specific immunity, Seitz filtrates were prepared from virulent human tubercle bacilli grown on a nonprotein synthetic medium (Wong-Weinzirl). The tuberculoprotein of high content, 0.7 mg. per cubic centimetre (after longer incubation), was prepared in pure form by precipitation with trichloracetic acid as well as by aseptic and antiseptic ultrafiltration. In addition the protein was further concentrated by washing and ultrafiltration, so that 1 cc. contained as high as 38 mg. Guinea pig experiments with these preparations proved that specific immunity against subsequent infections following subcutaneous injections with a virulent strain of human tubercle bacilli could not be produced by either the Seitz filtrates, the highly concentrated filtrates, or the precipitated pure tuberculoprotein, which last was tested as equivalent in potency to PPD (Parke-Davis). The highly concentrated filtrates, or precipitated tuberculoprotein, possessed no appreciable primary toxicity for normal animals. A primary intravenous injection of large amounts of normal filtrates, concentrates or precipitated tuberculoprotein did not sensitize to a second intracutaneous injection with a fairly large test dose (0.1 mg.) of either filtrate or tuberculoprotein. A reaction to tuberculin can be obtained, however, in a tuberculous guinea pig with as little as 0.000,005 mg. of the same material. A primary intravenous injection of about 2 mg. of tuberculoprotein in any of these three forms sensitized guinea pigs to a lethal intravenous provocative dose (anaphylactically) of as little as about 1 mg. of the tuberculoprotein in these forms. This confirms the studies of Zinsser. To produce cutaneous hypersensitiveness to tuberculoprotein requires a small amount of avirulent human tubercle bacilli (a tubercle-forming dose), a large amount of heat-killed tubercle bacilli (around 100 mg.) and very small amounts of virulent tubercle bacilli.—*The Effects of Tuberculoprotein: A Quantitative Study, H. J. Corper & M. L. Cohn, J. A. M. A., February 4, 1939, cxii, 403.—(G. L. L.)*

Tuberculin Reaction following Immunization with Heat-Killed Tubercle Bacilli.—A group of 72 colored boys four to fifteen years old, inmates of an industrial school in Jamaica, who failed to react to the injection of 1.0 mg. Old Tuberculin were injected intracutaneously with 0.1 mg. heat-killed tubercle bacilli at weekly intervals for five weeks. Those who were then negative to tuberculin were given 5 additional injections of the vaccine. Sixty-six boys who also failed to react to tuberculin served as controls. The vaccinated and control groups were given the intracutaneous tuberculin test at three-month intervals, over a period of forty-two months. During the first six months 91.2 per cent of the vaccinated reacted at one time or another. After twelve and eighteen months only 65.4 per cent reacted, but at thirty months the

per cent rose to 94.4 per cent, after which time the percentage of reactors again decreased. Among the control group positive tuberculin reactions reached a peak of 32.3 per cent thirty months after the beginning of the observations. No roentgenologically demonstrable lesions of tuberculosis were found in the inmates or staff of the school, and no cases of manifest tuberculosis were observed in the school during the course of the study. The author concludes that the intracutaneous injection of heat-killed tubercle bacilli induces tuberculin sensitivity, which in most instances persists for three years.—*Sensitization to Tuberculin Produced in Children by Heat-killed Tubercle Bacilli, E. W. Flahiff, Am. J. Hyg., September, 1939, xxx, 65.*—(*J. D. A.*)

Diagnostic Significance of Scoliosis.—The high incidence of scoliosis in cases of acute empyema, as compared to other types of intrathoracic disease as pleural effusion, pneumonia, pulmonary infarction, primary or secondary tumors, warrants its consideration as an important sign in differential diagnosis. The scoliosis seems to be due to an inflammatory reaction in the parietal pleura, and varies in degree directly with the duration of the disease, and inversely with the age of the patient. The deviation of the spine disappears promptly after cure of the empyema.—*The Diagnostic Significance of Scoliosis in Intrathoracic Disease, W. De W. Andrews & C. W. Holman, J. Thoracic Surg., June, 1939, viii, 520.*—(*L. F. B.*)

Right Apical Dulness.—Textbooks on physical diagnosis assert that the percussion note over the right apex is higher in pitch than that over the corresponding areas on the left. Various explanations are offered for this and warning given not to mistake this difference for early tuberculosis. However, on attempting to demonstrate this to medical students, numerous variations were encountered making a reinvestigation of the subject desirable. Two hundred and twenty-three medical students were used in this study. The higher pitch was found over the left apex in 158 students (70.58 per cent) and over the right apex in 65 students (29.01 per cent). In 77 students the percussion notes in the right and left supraclavicular and infraclavicular areas were compared with each other and with the note in the suprascapular region. The notes in the supraclavicular and infraclavicular areas were the same as the pitch in the supraclavicular area on the corresponding side in all but 10 students. It is suggested that the preponderance of lower pitch on the right side is due to the position of the epiarterial bronchus and the proximity of the right apex of the lung to the trachea. The techniques of audible and palpatory percussion are described and the suggestion made that the "feel" or "resistance" of a region is an expression of the vibratory sense. The value of palpatory percussion has not been emphasized sufficiently and the student and young practitioner would do well to cultivate the vibratory sense.—*The Alleged Dullness over the Apex of the Normal Right Lung, W. Coleman, Am. J. M. Sc., February, 1939, cxcvii, 141.*—(*G. F. M.*)

Key to Abstractors

A. A. E.: Adrian A. Ehler, New Rochelle, New York.
A. B. C.: Adele B. Cohn, Bedford Hills, New York.
A. B. T.: Alice B. Tobler, Bedford Hills, New York.
A. P.: Andrew Peters, Springfield, Massachusetts.
F. B. S.: Florence B. Seibert, Philadelphia, Pennsylvania.
F. G. P.: Frank G. Petrik, Oneonta, New York.
G. F. M.: Gertrude F. Mitchell, Detroit, Michigan.
G. L. L.: George L. Leslie, Howell, Michigan.
H. L. I.: Harold L. Israel, Philadelphia, Pennsylvania.
H. R. N.: H. R. Nayer, New York City.
J. D. A.: Joseph D. Aronson, Philadelphia, Pennsylvania.
J. G.: J. Goldberg, New York City.
J. S. W.: J. Stanley Woolley, Liberty, New York.
L. F. B.: Lauren F. Busby, Northville, Michigan.
M. B.: Miriam Brailey, Baltimore, Maryland.
M. B. L.: Max B. Lurie, Philadelphia, Pennsylvania.
M. T. W.: Mildred T. Woolley, Charleston, West Virginia.

INDEX OF ABSTRACTS OF TUBERCULOSIS

Abel, G. Resistance of acid-fast bacilli to chemicals, 61
Absorption of pleural fluids, 54
Acetylpolysaccharides, 61
Acid-fast bacilli, 55
—— ——, Resistance of, to chemicals, 61
—— bacteria, Growth of, in semisolid media, 63
Acne, Tubercle bacilli from, 60
Action of bacterial filtrates on tubercle bacilli, 62
—— —— tuberculous filtrates on central nervous system, 49
Active immunization in tuberculosis, 73
Adults, Hilar tuberculosis in, 31
——, Pulmonary tuberculosis in, 18
Aged, Pulmonary tuberculosis in, 22
Aggregation test, Basophilic, in cement workers, 53
Albert, L. Tuberculosis of symphysis pubis, 39
Allergy and hormones, 73
—— —— immunity, 73
Anachoresis in tuberculosis, 74
Anamnestic tuberculin test, 77
Anastomosis of pulmonary artery and systemic circulation, 51
Anatomy of bronchi, 45
Anderson, R. J., and Creighton, M. M. Avian tubercle bacillus wax, 66
Andrews, W. De W., and Holman, C. W. Diagnostic significance of scoliosis, 80
Animals, ascorbic acid treated, Tuberculosis in, 48
——, laboratory, Johne's disease in, 51
Antibodies in tuberculosis, 67, 68
Antiscorbutic vitamin in culture medium for tubercle bacilli, 63
Apical dulness, Right, 80
Applewhite, J. D., and Williams, G. D. Negro tuberculosis, 8
Arloing, P., Thévenot, L., and Viallier, J. Dissociation of tubercle bacilli, 64
Arterial and venous pressures, 54
——, Pulmonary, circulation, 43
Artery, pulmonary, and systemic circulation, Anastomosis of, 51
Ascoli, A. Anachoresis in tuberculosis, 74
Ascorbic acid, Effect of, on tuberculin reaction, 77
—— —— treated animals, Tuberculosis in, 48
Athlete's lung, 45
Auerbach, O., and Lipstein, S. Bronchopleural fistula, 25
Avian tubercle bacilli, Immunization against, 72
—— —— —— in diphtheroid cultures, 66
—— —— ——, Resistance of, to low temperatures, 66
—— —— bacillus wax, 66
—— tuberculosis, 65

Bablet, J. See Sezary, A., *et al.*, 60
Bacillaemia in experimental tuberculosis, 46
Bacilli, Acid-fast, 55
——, ——, Resistance of, to chemicals, 61
——, human and bovine, Serological differentiation of, 69
——, leprosy, rat, Chemistry of, 61
——, tubercle, Action of bacterial filtrates on, 62
——, ——, avian, Immunization against, 72
——, ——, ——, in diphtheroid cultures, 66
——, ——, ——, Resistance of, to low temperatures, 66
——, ——, Bovine, in Japan, 65
——, ——, culture medium for, Antiscorbutic vitamin in, 63
——, ——, —— of, 56
——, ——, Dissociation of, 63, 64
——, ——, from acne, 60
——, ——, Growth of, 62
——, ——, —— ——, in blood, 62
——, ——, heat-killed, immunization with, Tuberculin reaction following, 79

Bacilli, tubercle, heat-killed, Protective value of, 71
——, ——, in nontuberculous lung tissue, 58
——, ——, —— scars, lymph nodes and normal lung, 59
——, ——, —— urine, 58
——, ——, killed, Reaction to, 48
——, ——, Oxygen restriction and, 60
——, ——, Riboflavin produced by, 61
——, ——, Virulence of, 64, 65
Bacillus, tubercle, Bovine, from child's knee, 16
—— wax, tubercle, Avian, 66
Backer, Julie E. Mortality of pulmonary tuberculosis in Norway, 3
Bacteria, acid-fast, Growth of, in semisolid media, 63
Bacterial filtrates, Action of, on tubercle bacilli, 62
Baggenstoss, A. H., and Feldman, W. H. Tubercle bacilli in nontuberculous lung tissue, 58
Balgairies, E., and Debénédetti, R. L. Tuberculosis in a regiment, 8
Ballon, H. C., and Guernon, A. Sulfanilamide in guinea pigs, 49
——, ——. ——., —— ——, ——. Sulfanilamide *in vitro*, 61
Barach, A. L., and Swenson, P. Positive pressure breathing, 53
Barkley, H. See Humphreys, G. H., *et al.*, 54
Bashford, H. H. Tuberculosis in British post office service, 6
Basophilic aggregation test in cement workers, 53
Baumann, Th. Bovine infection in children, 15
BCG in guinea pigs, 47
—— vaccination, 72
Beck, A. Bacillaemia in experimental tuberculosis, 46
Belgorad, S. H., and Schain, P. Gastric lavage, 58
Bequignon, R. Tuberculosis in mice, 47
——, ——., and Boquet, A. BCG in guinea pigs, 47
Berdel, W., and Sander, E. Active immunization in tuberculosis, 73
Berg, S. Syphilis and tuberculosis, 29
——, ——., and Dieffenbach, R. H. Tuberculosis and suppurative infection, 21
Bernstein, J. C. Papulonecrotic tuberculosis, 41
Bindslev, G. See Jensen, K. A., *et al.*, 78
Birge, E. A. Pseudotuberculosis in guinea pigs, 51
Birkelo, C. C., and Brosius, W. L. Pulmonary arterial circulation, 43
Birkhaug, K. E. Allergy and immunity, 73
——, ——. ——. Effect of ascorbic acid on tuberculin reaction, 77
——, ——. ——. Tuberculosis in ascorbic acid treated animals, 48
——, ——. ——. Vitamin C and blood picture, 52
Blalock, A., and Levy, S. E. Anastomosis of pulmonary artery and systemic circulation, 51
Bloch, F., and Ducourtioux, M. Bovine tubercle bacillus from child's knee, 16
——, ——., —— Stamatin, N. Tuberculosis in mice, 47
——, ——. See Sezary, A., *et al.*, 60
Blood and spinal fluid in meningitis, 41
——, Growth of tubercle bacilli in, 62
—— picture, Vitamin C and, 52
Boddington, G. D. M. See Greey, P. H., *et al.*, 49
Boeck's sarcoid, 44
—— —— in brothers, 45
Boissevain, C. H., Drea, W. F., and Schultz, H. W. Riboflavin produced by tubercle bacilli, 61
Bone tuberculosis, 37
Bones, Cystic tuberculosis of, 38
Boquet, A. Virulence of tubercle bacilli, 65
——, ——., and Bequignon, R. BCG in guinea pigs, 47
Bovine bacilli, human and, Serological differentiation of, 69
—— infection in children, 15
—— tubercle bacilli in Japan, 65
—— —— bacillus from child's knee, 16
—— tuberculosis, Serodiagnosis of, 68
Breathing, Cinefluoroscopic studies of, 54
——, Positive pressure, 53
British Guiana, Tuberculosis in, 5, 6
—— post office service, Tuberculosis in, 6

Brocard, H., and Jacob, P. Pulmonary haemorrhage, 23
——, ——., —— Saenz, A. Virulence of tubercle bacilli, 64
Bronchi, Anatomy of, 45
Bronchial tuberculosis, 29
Bronchiectasis, Tuberculous, 20
Bronchogenic spread in children, 17
Bronchopleural fistula, 25
Bronchopneumonias, Tuberculous, 21
Brosius, W. L., and Birkelo, C. C. Pulmonary arterial circulation, 43
Brothers, Boeck's sarcoid in, 45
Brown, R. A., and Dearing, W. P. Tuberculin test, 75
Burge, F. W. Pennsylvania plan for tuberculosis, 7

Canetti, G., and Saenz, A. Tubercle bacilli in scars, lymph nodes and normal lung, 59
Capillaries, Pulmonary, in experimental pneumothorax, 55
Carvalho, A., and Vidal, C. Antiscorbutic vitamin in culture medium for tubercle bacilli, 63
Case-finding in Detroit, 7
Cavities, Healing of, 43
——, tuberculous, Healing of, 19
——, ——, Spontaneous healing of, 20
Cement workers, Basophilic aggregation test in, 53
Central nervous system, Action of tuberculous filtrates on, 49
Cervix uteri, Tuberculosis of, 36
Chattás, A. See Tortone, J., *et al.*, 16
Chemistry of rat leprosy bacilli, 61
Chemotherapy in experimental tuberculosis, 49
Child's knee, Bovine tubercle bacillus from, 16
Children, Bovine infection in, 15
——, Bronchogenic spread in, 17
——, Negative tuberculin reactions in, 17
——, Pulmonary tuberculosis in, 18
——, Tuberculosis in, 16
Ch'iu, P. T. Y., Myers, J. A., and Stewart, C. A. Primary infection, 14
Chronic miliary tuberculosis in infancy, 14
—— pericarditis, 32
Cinefluoroscopic studies of breathing, 54
Circulation, Pulmonary arterial, 43
——, systemic, Anastomosis of pulmonary artery and, 51
Clagett, O. T., and Walters, W. Tuberculosis of stomach, 33
Cleveland, M. Treatment of joint tuberculosis, 39
Coal miners, Tuberculosis in, 27
Cochrane, E. Tuberculosis in British Guiana, 5, 6
Cohen, A. C. Tuberculosis in coal miners, 27
Cohen, A. G., and Wessler, H. Bronchial tuberculosis, 29
Cohen, L., and Gershon-Cohen, J. Tuberculosilicosis, 26
Cohn, M. L., and Corper, H. J. Tuberculoprotein, 79
Coleman, W. Right apical dulness, 80
Collins, D. C. Tuberculosis of cervix uteri, 36
Complement fixation in tuberculosis, 67
Concentration and culture methods, 57
Contacts, tuberculous, Roentgenograms of, 16
Contralateral pneumothorax, 18
Cooke, W. E. Tuberculosis and pneumonoconiosis, 27
Corper, H. J. Culture of tubercle bacilli, 56
——, ——. ——., and Cohn, M. L. Tuberculoprotein, 79
Costantini, E. See Monaldi, V., *et al.*, 55
Cotter, E. F. Boeck's sarcoid, 44
Couland, E., and Lemanissier. Negative tuberculin test in tuberculous patients, 76
Coulter, J. S. See Hardt, L. L., *et al.*, 33
Cowdry, E. V., Ravold, A., and Packer, D. M. Chemistry of rat leprosy bacilli, 61
Coxitis, tuberculous, Operation of, 39
Creigton, M. M., and Anderson, R. J. Avian tubercle bacillus wax, 66
Culture, human leprosy, Filterability of, 67
—— medium for tubercle bacilli, Antiscorbutic vitamin in, 63
—— methods, Concentration and, 57
—— of tubercle bacilli, 56
—— versus guinea pig inoculation, 57

Cultures, diphtheroid, Avian tubercle bacilli in, 66
Cystic tuberculosis of bones, 38
Cystitis, Tuberculous, 36

Daddi, G., and Pana, C. Tuberculous bronchopneumonias, 21
D'Ambrosio, R. EKG in pulmonary tuberculosis, 25
Davies, H. N. Tuberculosis in Tanganyika, 4
Dearing, W. P., and Brown, R. A. Tuberculin test, 75
Debénédetti, R. L., and Balgairies, E. Tuberculosis in a regiment, 8
Deficiency, Vitamin A, 22
Delhumeau, H., and Lowys, P. Contralateral pneumothorax, 18
Desensitization of tuberculous guinea pigs, 74
Detroit, Case-finding in, 7
Diagnosis of tuberculosis, Guinea pig inoculation for, 57
——, Serological, of tuberculosis, 67
Diagnostic significance of scoliosis, 80
Dieffenbach, R. H., and Berg, S. Tuberculosis and suppurative infection, 21
Dillon, Beatrice M., and Steinbach, M. M. Sulfanilamide in experimental tuberculosis, 49
Diphtheroid cultures, Avian tubercle bacilli in, 66
Disease, Johne's, in laboratory animals, 51
Dissociation of tubercle bacilli, 63, 64
Douglas, B. H., and Harmon, G. E. Case-finding in Detroit, 7
Drea, W. F. See Boissevain, C. H., *et al.*, 61
Dressler, M. Boeck's sarcoid in brothers, 45
Ducourtioux, M., and Bloch, F. Bovine tubercle bacillus from child's knee, 16
Duerschner, D. R., and Murphy, W. A. Culture versus guinea pig inoculation, 57
Dulness, apical, Right, 80

Ear, Middle, tuberculosis, 40
Effect of ascorbic acid on tuberculin reaction, 77
EKG in pulmonary tuberculosis, 25
Embolism, pulmonary, Experimental, 52
Emmett, J. L., and Kibler, J. M. Renal tuberculosis, 34
Empyema, Tuberculous, 27
Endocarditis, Tuberculous, 33
Epidemic, Tuberculosis, on a Swedish island, 3
Epstein, B. S. Pulmonary veins, 44
Epstein, I. G., and Ornstein, G. G. Pregnancy and tuberculosis, 24
Erythrocyte sedimentation, 52
Evans, B., and Hanks, J. H. Growth of tubercle bacilli in blood, 62
Experimental immunity, 73
—— leprosy, 49
—— pneumothorax, Pulmonary capillaries in, 55
—— pulmonary embolism, 52
—— tuberculosis, Bacillaemia in, 46
—— ——, Chemotherapy in, 49
—— ——, Sulfanilamide in, 49
—— ——, Virulence in, 50

Faber, K. Tuberculosis and nutrition, 3
Farkas, A. Operation of tuberculous coxitis, 39
Feldman, H. A., and Hanks, J. H. Tubercle bacilli in urine, 58
Feldman, W. H., and Baggenstoss, A. H. Tubercle bacilli in nontuberculous lung tissue, 58
Fenkner, M., and Nagel, A. Antibodies in tuberculosis, 68
Ferretti, R. See Monaldi, V., *et al.*, 55
Filterability of human leprosy culture, 67
Filtrates, bacterial, Action of, on tubercle bacilli, 62
——, tuberculous, Action of, on central nervous system, 49
Finland, Tuberculosis in, 4
Finn, M. See Getz, H. R., *et al.*, 22
Fiorio, C. Virulence in experimental tuberculosis, 50
Fischel, K. Social aspects, 2
Fistula, Bronchopleural, 25
Flahiff, E. W. Tuberculin reaction following immunization with heat-killed tubercle bacilli, 79
——, ——. ——. Tuberculin test, 76
——, ——. ——. See Opie, E. L., *et al.*, 71
Forbes, J. R. Tuberculin tests, 75

Freund, J., and Hehre, E. Tuberculosis in rats, 46
Frimodt-Möller, J. Dissociation of tubercle bacilli, 63
Froyez-Roederer, and Meyer, K. Serological diagnosis of tuberculosis, 67
Fulton, R. P. See Toomey, J. A., *et al.*, 41

Gad, N., and Harpoth, H. Pleural perforation in pulmonary tuberculosis, 25
Gass, P. H. See Puffer, Ruth R., *et al.*, 1
Gass, R. S. See Puffer, Ruth R., *et al.*, 1, 21
Gastric lavage, 58
Gastrointestinal symptoms in tuberculosis, 23
Genital tuberculosis, 37
Gerendasy, J., and Granet, E. Perianal tuberculosis, 34
Gershon-Cohen, J., and Cohen, L. Tuberculosilicosis, 26
Getz, H. R., Hildebrand, G. B., and Finn, M. Vitamin A deficiency, 22
Gill, W. G., and Mann, W. N. Tuberculosis of spleen, 31
Gilmour, W. See Neil, J. H., *et al.*, 45
Goldberger, Esther W., and Siegel, M. Whooping cough and tuberculosis, 15
——, —— ——., —— Vollmer, H. Tuberculin patch test, 75
Gonzalez, L. M. See Long, E. R., *et al.*, 31
Gosse, A. H. Tuberculosis and life insurance, 13
Granet, E., and Gerendasy, J. Perianal tuberculosis, 34
Greenberger, A. J., and Parkes, M. Postnephrectomy sinuses, 36
Greey, P. H., Boddington, G. D. M., and Little, M. H. Chemotherapy in experimental tuberculosis, 49
Growth of acid-fast bacteria in semisolid media, 63
—— —— tubercle bacilli, 62
—— —— —— —— in blood, 62
Guernon, A., and Ballon, H. C. Sulfanilamide in guinea pigs, 49
——, ——., —— ——, ——. ——. Sulfanilamide *in vitro*, 61
Guinea pig inoculation, Culture versus, 57
—— —— —— for diagnosis of tuberculosis, 57
Guinea pigs, BCG in, 47
—— ——, Pseudotuberculosis in, 51
—— ——, Sulfanilamide in, 49
—— ——, Tuberculin reaction in, 77
—— ——, tuberculous, Desensitization of, 74
Gundel, M., and Heine, W. Complement fixation in tuberculosis, 67
Gutierrez, R. See Scholl, A. J., *et al.*, 35
Gwynne, F. J. See Neil, J. H., *et al.*, 45

H37, Mucoid phase of, 65
Haefliger, E. Growth of acid-fast bacteria in semisolid media, 63
Haemorrhage, Pulmonary, 23
Hanks, J. H., and Evans, B. Growth of tubercle bacilli in blood, 62
——, ——. ——., —— Feldman, H. A. Tubercle bacilli in urine, 58
Hansen, A. See Jensen, K. A., *et al.*, 78
Hardt, L. L., Weissman, M., Coulter, J. S., and Henrichsen, K. J. Intestinal tuberculosis, 33
Harmon, G. E., and Douglas, B. H. Case-finding in Detroit, 7
Harpoth, H., and Gad, N. Pleural perforation in pulmonary tuberculosis, 25
Hastings, E. G. See McCarter, J., *et al.*, 69
——, ——. ——., and McCarter, J. Avian tubercle bacilli in diphtheroid cultures, 66
Healing of cavities, 43
—— —— tuberculous cavities, 19
——, Spontaneous, of tuberculous cavities, 20
Heat-killed tubercle bacilli, immunization with, Tuberculin reaction following, 79
—— —— ——, Protective value of, 71
Hehre, E., and Freund, J. Tuberculosis in rats, 46
Heimbeck, J. Tuberculosis in student nurses, 10
Heine, W., and Gundel, M. Complement fixation in tuberculosis, 67
Heise, F. H., and Steidl, J. H. Venous pressure, 24
Hellerstroem, S. Primary tuberculosis of skin, 41
Helweg-Larsen, P., and Holm, J. Positive Mantoux test and immunity, 76

Hendry, Esther. Blood and spinal fluid in meningitis, 41
Henrichsen, K. J. See Hardt, L. L., *et al.*, 33
Hensel, G. Tuberculin reaction in guinea pigs, 77
Hepler, A. B. See Scholl, A. J., *et al.*, 35
Herbst, W. P. Renal tuberculosis, 35
Heuer, G. J., and Stewart, H. J. Chronic pericarditis, 32
Hilar tuberculosis in adults, 31
Hildebrand, G. B. See Getz, H. R., *et al.*, 22
Hinman, F. See Scholl, A. J., *et al.*, 35
Hoffman, M. Spontaneous healing of tuberculous cavities, 20
Holden, F. R., and Ralston, C. E. Basophilic aggregation test in cement workers, 53
Holm, J., and Helweg-Larsen, P. Positive Mantoux test and immunity, 76
Holman, C. W., and Andrews, W. DeW. Diagnostic significance of scoliosis, 80
Hormones, Allergy and, 73
Howe, J. S. Bacillaemia in experimental tuberculosis, 46
Human and bovine bacilli, Serological differentiation of, 69
—— leprosy culture, Filterability of, 67
Humphreys, G. H., Moore, R. L., and Barkley, H. Arterial and venous pressures, 54
Hunt, L. W. Tuberculin test, 74

Immunity, Allergy and, 73
——, Experimental, 73
——, Positive Mantoux test and, 76
Immunization, Active, in tuberculosis, 73
—— against avian tubercle bacilli, 72
—— with heat-killed tubercle bacilli, Tuberculin reaction following, 79
Industry, Tuberculosis in, 1
Infancy, Chronic miliary tuberculosis in, 14
Infection, Bovine, in children, 15
——, Primary, 14
——, suppurative, Tuberculosis and, 21
——, Tuberculous, and reinfection, 42
Inoculation, guinea pig, Culture versus, 57
——, —— ——, for diagnosis of tuberculosis, 57
Insurance, life, Tuberculosis and, 13
Intercostal lymph nodes, Tuberculosis of, 30
Intestinal tuberculosis, 33
Italy, Tuberculosis mortality in, 2

Jacob. Pregnancy and tuberculosis, 24
Jacob, P., and Brocard, H. Pulmonary haemorrhage, 23
Jacobs, A. L. Tuberculosis in Scandinavian students, 9
Japan, Bovine tubercle bacilli in, 65
Jensen, K. A., Bindslev, G., Möller, S., Hansen, A., and Lind, R. Old Tuberculin and purified tuberculin, 78
Johne's disease in laboratory animals, 51
Joint, knee, Tuberculosis of, 38
——, ——, ——, Surgery in, 38
—— tuberculosis, Treatment of, 39
Joress, M. H. Pulmonary tuberculosis in aged, 22

Kanne, E. M. See McCarter, J., *et al.*, 69
Kartagener, M., and Löffler, W. Medico-legal aspect of tuberculosis, 12
Kibler, J. M., and Emmett, J. L. Renal tuberculosis, 34
Killed tubercle bacilli, Reaction to, 48
Kimura, R., and Kondo, H. Bovine tubercle bacilli in Japan, 65
Knee, child's, Bovine tubercle bacillus from, 16
—— joint, Tuberculosis of, 38
—— —— ——, Surgery in, 38
Kondo, H., and Kimura, R. Bovine tubercle bacilli in Japan, 65
Kriz, J. R., and Loving, W. L. Experimental leprosy, 49
——, ——. ——., —— ——, ——. ——. Filterability of human leprosy culture, 67
Kruglick, J. S., and Novak, J. B. Anamnestic tuberculin test, 77
Kyes, P., and Potter, T. S. Resistance of avian tubercle bacilli to low temperatures, 66

Laboratory animals, Johne's disease in, 51
Law, J. L. Cystic tuberculosis of bone, 38
Lemanissier, and Couland, E. Negative tuberculin test in tuberculous patients, 76

Lemon, W. S. Primary tubercle, 42
Leprosy bacilli, rat, Chemistry of, 61
—— culture, human, Filterability of, 67
——, Experimental, 49
Levine, M. A., and Rosenberg, H. A. Roentgenograms of tuberculous contacts, 16
Levy, S. E., and Blalock, A. Anastomosis of pulmonary artery and systemic circulation, 51
Life insurance, Tuberculosis and, 13
Lind, R. See Jensen, K. A., *et al.*, 78
Lipstein, S., and Auerbach, O. Bronchopleural fistula, 25
Little, M. H. See Greey, P. H., *et al.*, 49
Lobo, J., and Nebias, O. Vitamin C in pulmonary tuberculosis, 23
Löffler, W., and Kartagener, M. Medico-legal aspect of tuberculosis, 12
Long, E. R. Tuberculosis in students, 9
——, ——. ——., Seibert, M. V., and Gonzalez, L. M. Tuberculosis of tonsils, 31
Loving, W. L., and Kriz, J. R. Experimental leprosy, 49
——, ——. ——., —— ——, ——. ——. Filterability of human leprosy culture, 67
Lowys, P., and Delhumeau, H. Contralateral pneumothorax, 18
Lung, Athlete's, 45
——, normal, scars, lymph nodes and, Tubercle bacilli in, 59
—— tissue, nontuberculous, Tubercle bacilli in, 58
Lurie, M. B. Phagocytes in tuberculosis, 70
——, ——. ——. Resistance to tuberculosis, 69
Lustok, M. J., and Miller, E. A. Genital tuberculosis, 37
Lymph nodes, intercostal, Tuberculosis of, 30
—— ——, scars, and normal lung, Tubercle bacilli in, 59

Macpherson, A. Margaret C. Primary tuberculosis, 13
Maier, H. C. Absorption of pleural fluids, 54
Malojčić, M. Pulmonary tuberculosis in adults, 18
Mann, W. N., and Gill, W. G. Tuberculosis of spleen, 31
Mantoux test, Positive, and immunity, 76
Mark, J. Tuberculous endocarditis, 33
Martin, D. W. Cystic tuberculosis of bones, 38
Maxwell, J. Intestinal tuberculosis, 33
McCarter, J., and Hastings, E. G. Avian tubercle bacilli in diphtheroid cultures, 66
——, ——., Kanne, E. M., and Hastings, E. G. Precipitins for tuberculin, 69
McKeever, F. M. Tuberculosis of knee joint, 38
McKinney, Ruth A., and Mellon, R. R. Mucoid phase of H37, 65
Media, semisolid, Growth of acid-fast bacteria in, 63
Medico-legal aspect of tuberculosis, 12
Medium, culture, for tubercle bacilli, Antiscorbutic vitamin in, 63
Mellon, R. R., and McKinney, Ruth A. Mucoid phase of H37, 65
Mendlowitz, M. Experimental pulmonary embolism, 52
Meningitis, Blood and spinal fluid in, 41
——, tuberculous, Tryptophan in, 41
Methods, Concentration and culture, 57
Meyer, K. Serological differentiation of human and bovine bacilli, 69
——, ——., and Froyez-Roederer. Serological diagnosis of tuberculosis, 67
Mice, Tuberculosis in, 47
Middle ear tuberculosis, 40
Miliary tuberculosis, Chronic, in infancy, 14
Milk-borne tuberculosis, 3
Miller, E. A., and Lustok, M. J. Genital tuberculosis, 37
Miller, R. F. See Widmann, B. P., *et al.*, 37
Miners, coal, Tuberculosis in, 27
Mohler, W. M. Johne's disease in laboratory animals, 51
Möller, S. See Jensen, K. A., *et al.*, 78
Monaldi, V., Ferretti, R., and Costantini, E. Pulmonary capillaries in experimental pneumothorax, 55
Moore, R. L. See Humphreys, G. H., *et al.*, 54
Mortality of pulmonary tuberculosis in Norway, 3

Mortality, Tuberculosis, in Italy, 2
Mucoid phase of H37, 65
Muller, R. W. Bronchogenic spread in children, 17
——, ——. ——. Middle ear tuberculosis, 40
Murano, G. Chronic miliary tuberculosis in infancy, 14
Murphy, W. A., and Duerschner, D. R. Culture versus guinea pig inoculation, 57
Myers, J. A. See Ch'iu, P. T. Y., *et al.*, 14
——, ——. ——. See Tortone, J., *et al.*, 16

Naeslund, C. BCG vaccination, 72
Nagel A. Antibodies in tuberculosis, 67
——, ——., and Fenkner, M. Antibodies in tuberculosis, 68
——, ——., —— Selter, H. Experimental immunity, 73
Nebias, O., and Lobo, J. Vitamin C in pulmonary tuberculosis, 23
Negative tuberculin reactions in children, 17
—— —— test in tuberculous patients, 76
Negro tuberculosis, 8
Neil, J. H., Gilmour, W., and Gwynne, F. J. Anatomy of bronchi, 45
Nervous system, central, Action of tuberculous filtrates on, 49
Neustadt, A., and Weiner, S. B. Tuberculin patch test, 75
New York state tuberculosis program, 6
Nontuberculous lung tissue, Tubercle bacilli in, 58
Norway, pulmonary tuberculosis in, Mortality of, 3
Novak, J. B., and Kruglick, J. S. Anamnestic tuberculin test, 77
Nürmberger, W. Athlete's lung, 45
Nurses, student, Tuberculosis in, 10
Nutrition, Tuberculosis and, 3

O'Connor, V. J. See Scholl, A. J., *et al.*, 35
Oekonomopoulos, N. B. Negative tuberculin reactions in children, 17
Ohta, T. See Takeda, Y., *et al.*, 61
Olcott, C. T. Reaction to killed tubercle bacilli, 48
Old Tuberculin and purified tuberculin, 78
Operation of tuberculous coxitis, 39
Opie, E. L., Flahiff, E. W., and Smith, H. H. Protective value of heat-killed tubercle bacilli, 71
Ornstein, G. G., and Epstein, I. G. Pregnancy and tuberculosis, 24
——, ——. ——., —— Ulmar, D. Tuberculosis in industry, 1
——, ——. ——., —— ——, ——. Tuberculous empyema, 27
Ostrum, H. W. See Widmann, B. P., *et al.*, 37
OT and PPD, 79
Otte, W. Gastrointestinal symptoms in tuberculosis, 23
Otto, U., and Staemmler, M. Hilar tuberculosis in adults, 31
Oxygen restriction and tubercle bacilli, 60

Packer, D. M. See Cowdry, E. V., *et al.*, 61
Pagel, W., and Simmonds, F. A. H. Healing of cavities, 43
Pana, C., and Daddi, G. Tuberculous bronchopneumonias, 21
Papulonecrotic tuberculosis, 41
Parkes, M., and Greenberger, A. J. Postnephrectomy sinuses, 36
Patch test, Tuberculin, 75, 76
Patients, tuberculous, Negative tuberculin test in, 76
Peck, E. C., and Wegman, M. E. Tuberculin patch test, 76
Pennsylvania plan for tuberculosis, 7
Perforation, Pleural, in pulmonary tuberculosis, 25
Perianal tuberculosis, 34
Pericarditis, Chronic, 32
——, Tuberculous, 32
Perry, A., and Petran, E. Concentration and culture methods, 57
Petran, E., and Perry, A. Concentration and culture methods, 57
Petroff, S. A., and Schain, P. Acid-fast bacilli, 55
Phagocytes in tuberculosis, 70
Pickhardt, O. C., Stewart, W. H., and Thorburn, G. Cinefluoroscopic studies of breathing, 54
Pietsch, W. Pulmonary tuberculosis in children, 18
Placental tuberculosis, 37

Platon, R. V. Tuberculous pericarditis, 32
Pleural fluids, Absorption of, 54
—— perforation in pulmonary tuberculosis, 25
Plunkett, R. E. New York state tuberculosis program, 6
Pneumonoconiosis, Tuberculosis and, 27
Pneumothorax, Contralateral, 18
——, experimental, Pulmonary capillaries in, 55
Positive Mantoux test and immunity, 76
—— pressure breathing, 53
Post office service, British, Tuberculosis in, 6
Postnephrectomy sinuses, 36
Potter, T. S. Oxygen restriction and tubercle bacilli, 60
——, ——. ——., and Kyes, P. Resistance of avian tubercle bacilli to low temperatures, 66
PPD, OT and, 79
Precipitins for tuberculin, 69
Pregnancy and tuberculosis, 24
Priestley, J. T. See Scholl, A. J., *et al.*, 35
Primary infection, 14
—— tubercle, 42
—— tuberculosis, 13
—— —— of skin, 41
Program, tuberculosis, New York state, 6
Protective value of heat-killed tubercle bacilli, 71
Pseudotuberculosis in guinea pigs, 51
Puffer, Ruth R., Stewart, H. C., Gass, P. H., and Gass, R. S. Statistics of tuberculosis, 1
——, ——. ——., ——, ——. ——., and Gass, R. S. Untreated tuberculosis, 21
Pulmonary arterial circulation, 43
—— artery and systemic circulation, Anastomosis of, 51
—— capillaries in experimental pneumothorax, 55
—— embolism, Experimental, 52
—— haemorrhage, 23
—— tuberculosis, EKG in, 25
—— —— in adults, 18
—— —— —— aged, 22
—— —— —— children, 18
—— —— —— Norway, Mortality of, 3
—— ——, Pleural perforation in, 25
Pulmonary tuberculosis, Takata reaction in, 53
—— ——, Vitamin C in, 23
—— veins, 44
Purified tuberculin, Old Tuberculin and, 78

Racugno, A. Action of tuberculous filtrates on central nervous system, 49
Ralston, C. E., and Holden, F. R. Basophilic aggregation test in cement workers, 53
Rat leprosy bacilli, Chemistry of, 61
Rats, Tuberculosis in, 46
Ravold, A. See Cowdry, E. V., *et al.*, 61
Rea, F. W. See Toomey, J. A., *et al.*, 41
Reaction, Takata, in pulmonary tuberculosis, 53
—— to killed tubercle bacilli, 48
——, tuberculin, Effect of ascorbic acid on, 77
——, ——, following immunization with heat-killed tubercle bacilli, 79
——, ——, in guinea pigs, 77
Reactions, tuberculin, Negative, in children, 17
Reinfection, Tuberculous infection and, 42
Relapse in tuberculosis, 19
Renal tuberculosis, 34, 35
Resistance of acid-fast bacilli to chemicals, 61
—— —— avian tubercle bacilli to low temperatures, 66
—— to tuberculosis, 69
Rest, A. Erythrocyte sedimentation, 52
Riboflavin produced by tubercle bacilli, 61
Right apical dulness, 80
Roentgenograms of tuberculous contacts, 16
Rosenberg, H. A., and Levine, M. A. Roentgenograms of tuberculous contacts, 16
Rugiero, H. R. Healing of tuberculous cavities, 19

Saenz, A. Avian tuberculosis, 65
——, ——., and Brocard, H. Virulence of tubercle bacilli, 64
——, ——., —— Canetti, G. Tubercle bacilli in scars, lymph nodes and normal lung, 59

Sander, E., and Berdel, W. Active immunization in tuberculosis, 73
Sarcoid, Boeck's, 44
——, ——, in brothers, 45
Sarnowiec, W. Action of bacterial filtrates on tubercle bacilli, 62
Sato, M. See Takeda, Y., *et al.*, 61
Savonem, S. Tuberculosis in Finland, 4
Scandinavian students, Tuberculosis in, 9
Scars, lymph nodes and normal lung, Tubercle bacilli in, 59
Schaefer, G. Placental tuberculosis, 37
Schaefer, W. Serodiagnosis of bovine tuberculosis, 68
Schain, P., and Belgorad, S. H. Gastric lavage, 58
——, ——., —— Petroff, S. A. Acid-fast bacilli, 55
Schmengler, F. E. Takata reaction in pulmonary tuberculosis, 53
Scholl, A. J., Hinman, F., Von Lichtenberg, A., Hepler, A. B., Gutierrez, R., Thompson, G. J., Priestley, J. T., Wildbolz, E., and O'Connor, V. J. Renal tuberculosis, 35
Schultz, H. W. See Boissevain, C. H., *et al.*, 61
Schuster, N. H. Erythrocyte sedimentation, 52
Scoliosis, Diagnostic significance of, 80
Sedimentation, Erythrocyte, 52
Seibert, M. V. See Long, E. R., *et al.*, 31
Seideman, R. M. OT and PPD, 79
Selter, H., and Nagel, A. Experimental immunity, 73
Serodiagnosis of bovine tuberculosis, 68
Serological diagnosis of tuberculosis, 67
—— differentiation of human and bovine bacilli, 69
Sezary, A., Bablet, J., and Bloch, F. Tubercle bacilli from acne, 60
Sher, B. C., and Sweany, H. C. Growth of tubercle bacilli, 62
Siegel, M., and Goldberger, Esther W. Whooping cough and tuberculosis, 15
Significance, Diagnostic, of scoliosis, 80
Simmonds, F. A. H., and Pagel, W. Healing of cavities, 43
Sinuses, Postnephrectomy, 36
Skin, Primary tuberculosis of, 41
Smith, H. H. See Opie, E. L., *et al.*, 71
Social aspects, 2
Spinal fluid, Blood and, in meningitis, 41
Spleen, Tuberculosis of, 31
Spontaneous healing of tuberculous cavities, 20
Spread, Bronchogenic, in children, 17
Staemmler, M., and Otto, U. Hilar tuberculosis in adults, 31
Stahl, S. Milk-borne tuberculosis, 3
Stamatin, N., and Bloch, F. Tuberculosis in mice, 47
Statistics of tuberculosis, 1
Steidl, J. H., and Heise, F. H. Venous pressure, 24
Steinbach, M. M., and Dillon, Beatrice M. Sulfanilamide in experimental tuberculosis, 49
Stewart, C. A. See Ch'iu, P. T. Y., *et al.*, 14
——, ——. ——. See Tortone, J., *et al.*, 16
Stewart, H. C See Puffer, Ruth R., *et al.*, 1, 21
Stewart, H. J., and Heuer, G. J. Chronic pericarditis, 32
Stewart, W. H. See Pickhardt, O. C., *et al.*, 54
Stiehm, R. H. Tuberculosis among students, 11
Stomach, Tuberculosis of, 33
Streukens, T. See Tortone, J., *et al.*, 16
Student nurses, Tuberculosis in, 10
Students, Scandinavian, Tuberculosis in, 9
——, Tuberculosis among, 11
——, —— in, 9
Sulfanilamide in experimental tuberculosis, 49
—— —— guinea pigs, 49
—— *in vitro*, 61
Suppurative infection, Tuberculosis and, 21
Surgery in knee joint tuberculosis, 38
Sweany, H. C. Tuberculous infection and reinfection, 42
——, ——. ——., and Sher, B. C. Growth of tubercle bacilli, 62
Swedish island, Tuberculosis epidemic on, 3
Swenson, P., and Barach, A. L. Positive pressure breathing, 53
Sylla, A. Allergy and hormones, 73

Syphilis and tuberculosis, 29
Symphysis pubis, Tuberculosis of, 39
Symptoms, Gastrointestinal, in tuberculosis, 23
Systemic circulation, Anastomosis of pulmonary artery and, 51

Takata reaction in pulmonary tuberculosis, 53
Takeda, Y., Ohta, T., and Sato, M. Acetyl polysaccharides, 61
Tanganyika, Tuberculosis in, 4
Temperatures, low, Resistance of avian tubercle bacilli to, 66
Test, Mantoux, Positive, and immunity, 76
——, patch, Tuberculin, 75, 76
——, Tuberculin, 74, 75, 76
——, ——, Anamnestic, 77
——, ——, Negative, in tuberculous patients, 76
Tests, Tuberculin, 75
Thayer, J. D. Desensitization of tuberculous guinea pigs, 74
Thévenot, L. See Arloing, P., *et al.*, 64
Thompson, G. J. See Scholl, A. J., *et al.*, 35
Thorburn, G. See Pickhardt, O. C., *et al.*, 54
Tizzano, A. Tuberculosis mortality in Italy, 2
Tonsils, Tuberculosis of, 31
Toomey, J. A., Fulton, R. P., and Rea, F. W. Tryptophan in tuberculous meningitis, 41
Tortone, J., Chattás, A., Myers, J. A., Stewart, C. A., and Streukens, T. Tuberculosis in children, 16
Toumey, J. W., Jr. Surgery in knee joint tuberculosis, 38
Treatment of joint tuberculosis, 39
Tryptophan in tuberculous meningitis, 41
Tsuge, Y. Tubercle bacilli in urine, 58
Tubercle bacilli, Action of bacterial filtrates on, 62
—— ——, avian, Immunization against, 72
—— ——, ——, in diphtheroid cultures, 66
—— ——, ——, Resistance of, to low temperatures, 66
—— ——, Bovine, in Japan, 65
—— ——, culture medium for, Antiscorbutic vitamin in, 63
Tubercle bacilli, culture of, 56
—— ——, Dissociation of, 63, 64
—— —— from acne, 60
—— ——, Growth of, 62
—— ——, —— ——, in blood, 62
—— ——, heat-killed, immunization with, Tuberculin reaction following, 79
—— ——, ——, Protective value of, 71
—— —— in nontuberculous lung tissue, 58
—— —— —— scars, lymph nodes and normal lung, 59
—— —— —— urine, 58
—— ——, killed, Reaction to, 48
—— ——, Oxygen restriction and, 60
—— ——, Riboflavin produced by, 61
—— ——, Virulence of, 64, 65
—— bacillus, Bovine, from child's knee, 16
—— —— wax, Avian, 66
——, Primary, 42
Tuberculin patch test, 75, 76
——, Precipitins for, 69
——, purified, Old Tuberculin and, 78
—— reaction, Effect of ascorbic acid on, 77
—— —— following immunization with heat-killed tubercle bacilli, 79
—— —— in guinea pigs, 77
—— reactions, Negative, in children, 17
—— test, 74, 75, 76
—— ——, Anamnestic, 77
—— ——, Negative, in tuberculous patients, 76
—— tests, 75
Tuberculoprotein, 79
Tuberculosilicosis, 26
Tuberculosis, Active immunization in, 73
—— among students, 11
——, Anachoresis in, 74
—— and life insurance, 13
—— —— nutrition, 3
—— —— pneumonoconiosis, 27
—— —— suppurative infection, 21
——, Antibodies in, 67, 68
——, Avian, 65
——, Bone, 37
——, bovine, Serodiagnosis, of, 68
——, Bronchial, 29
——, Complement fixation in, 67
——, Cystic, of bones, 38
——, diagnosis of, Guinea pig inoculation for, 57

Tuberculosis epidemic on a Swedish island, 3
——, experimental, Bacillaemia in, 46
——, ——, Chemotherapy in, 49
——, ——, Sulfanilamide in, 49
——, ——, Virulence in, 50
——, Gastrointestinal symptoms in, 23
——, Genital, 37
——, Hilar, in adults, 31
—— in a regiment, 8
—— —— ascorbic acid treated animals, 48
—— —— British Guiana, 5, 6
—— —— —— post office service, 6
—— —— children, 16
—— —— coal miners, 27
—— —— Finland, 4
—— —— industry, 1
—— —— mice, 47
—— —— rats, 46
—— —— Scandinavian students, 9
—— —— student nurses, 10
—— —— students, 9
—— —— Tanganyika, 4
——, Intestinal, 33
——, joint, Treatment of, 39
——, knee joint, Surgery in, 38
——, Medico-legal aspect of, 12
——, Middle ear, 40
——, miliary, Chronic, in infancy, 14
——, Milk-borne, 3
—— mortality in Italy, 2
——, Negro, 8
—— of cervix uteri, 36
—— —— intercostal lymph nodes, 30
—— —— knee joint, 38
—— —— spleen, 31
—— —— stomach, 33
—— —— symphysis pubis, 39
—— —— tonsils, 31
——, Papulonecrotic, 41
——, Pennsylvania plan for, 7
——, Perianal, 34
——, Phagocytes in, 70
——, Placental, 37
——, Pregnancy and, 24
——, Primary, 13
——, ——, of skin, 41
—— program, New York state, 6
——, pulmonary, EKG in, 25
——, ——, in adults, 18
Tuberculosis, pulmonary, in aged, 22
——, ——, —— children, 18
——, ——, —— Norway, Mortality of, 3
——, ——, Pleural perforation in, 25
——, ——, Takata reaction in, 53
——, ——, Vitamin C in, 23
——, Relapse in, 19
——, Renal, 34, 35
——, Resistance to, 69
——, Serological diagnosis of, 67
——, Statistics of, 1
——, Syphilis and, 29
——, Untreated, 21
——, Whooping cough and, 15
Tuberculous bronchiectasis, 20
—— bronchopneumonias, 21
—— cavities, Healing of, 19
—— ——, Spontaneous healing of, 20
—— contacts, Roentgenograms of, 16
—— coxitis, Operation of, 39
——, cystitis, 36
—— empyema, 27
—— endocarditis, 33
—— filtrates, Action of, on central nervous system, 49
—— guinea pigs, Desensitization of, 74
—— infection and reinfection, 42
—— meningitis, Tryptophan in, 41
—— patients, Negative tuberculin test in, 76
—— pericarditis, 32

Ulmar, D., and Ornstein, G. G. Tuberculosis in industry, 1
——, ——., —— ——, ——. ——. Tuberculous empyema, 27
Untreated tuberculosis, 21
Urine, Tubercle bacilli in, 58
Uteri, cervix, Tuberculosis of, 36

Vaccination, BCG, 72
van Deinse, F. Immunization against avian tubercle bacilli, 72
Van Hazel, W. Tuberculosis of intercostal lymph nodes, 30
Veins, Pulmonary, 44
Venous pressure, 24
—— pressures, Arterial and, 54
Viallier, J. See Arloing, P., *et al.*, 64

Vidal, C., and Carvalho, A. Antiscorbutic vitamin in culture medium for tubercle bacilli, 63
Vieweg, G. Tuberculosis epidemic on a Swedish island, 3
Virulence in experimental tuberculosis, 50
—— of tubercle bacilli, 64, 65
Vitamin A deficiency, 22
——, Antiscorbutic, in culture medium for tubercle bacilli, 63
—— C and blood picture, 52
—— —— in pulmonary tuberculosis, 23
Vollmer, H., and Goldberger, Esther W. Tuberculin patch test, 75
Von Lichtenberg, A. See Scholl, A. J., *et al.*, 35

Walters, W., and Clagett, O. T. Tuberculosis of stomach, 33
Wax, Avian tubercle bacillus, 66
Wear, J. B. Tuberculous cystitis, 36
Wegman, M. E., and Peck, E. C. Tuberculin patch test, 76
Weiner, S. B., and Neustadt, A. Tuberculin patch test, 75
Weissman, M. See Hardt, L. L., *et al.*, 33
Wessler, H., and Cohen, A. G. Bronchial tuberculosis, 29
Whooping cough and tuberculosis, 15
Widmann, B. P., Ostrum, H. W., and Miller, R. F. Bone tuberculosis, 37
Wildbolz, E. See Scholl, A. J., *et al.*, 35
Williams, G. C. Relapse in tuberculosis, 19
Williams, G. D., and Applewhite, J. D. Negro tuberculosis, 8
Wilson, R. Tuberculous bronchiectasis, 20
Woolsey, C. I. Guinea pig inoculation for diagnosis of tuberculosis, 57
Workers, cement, Basophilic aggregation test in, 53

Young, F. H. Relapse in tuberculosis, 19

Advance Notice

The June issue of the American Review of Tuberculosis will carry

A SUPPLEMENT:

TUBERCULOSIS CASE-FINDING

Studies In Mass Surveys

BY

HERBERT R. EDWARDS, M.D.

Director, Bureau of Tuberculosis, City of New York Department of Health. The material presented in about 176 pages deals with mass surveys of the apparently healthy adult population. Over 225,000 persons are included in this survey. Copies will be available from The American Review of Tuberculosis, 50 West 50 Street, New York, N.Y. Pre-publication price, 50¢ per copy.

The above data will be of interest to readers of the new

MANUAL *of* TUBERCULOSIS CASE-FINDING

A

REPORT

of the Subcommittee on Case-finding Procedures in Tuberculosis of the American Public Health Association

Published by the National Tuberculosis Association, April 15, 1940. Obtainable from state and local tuberculosis associations. Price 25¢

Please Order Now

TEMPGLASS THERMOMETERS

For Accuracy and Economy

Non-rolling, triangular top; specially tempered, extra-tough glass tubing; complete absence of file markings on scale . . . these are reasons why there is less breakage with TEMPGLASS Thermometers; . . . why they COST LESS PER YEAR. Accurate, no hard shakers, easy shakers or "retreaters". Preferred by sanatoria superintendents, doctors, nurses, patients. TEMPGLASS Thermometers last longer, give better service.

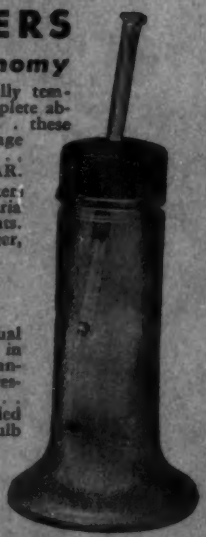
List Price - - - - - $84.00 per gross
Hospital Price - - - $72.00 per gross

IN KAYBUD STERILIZING JAR

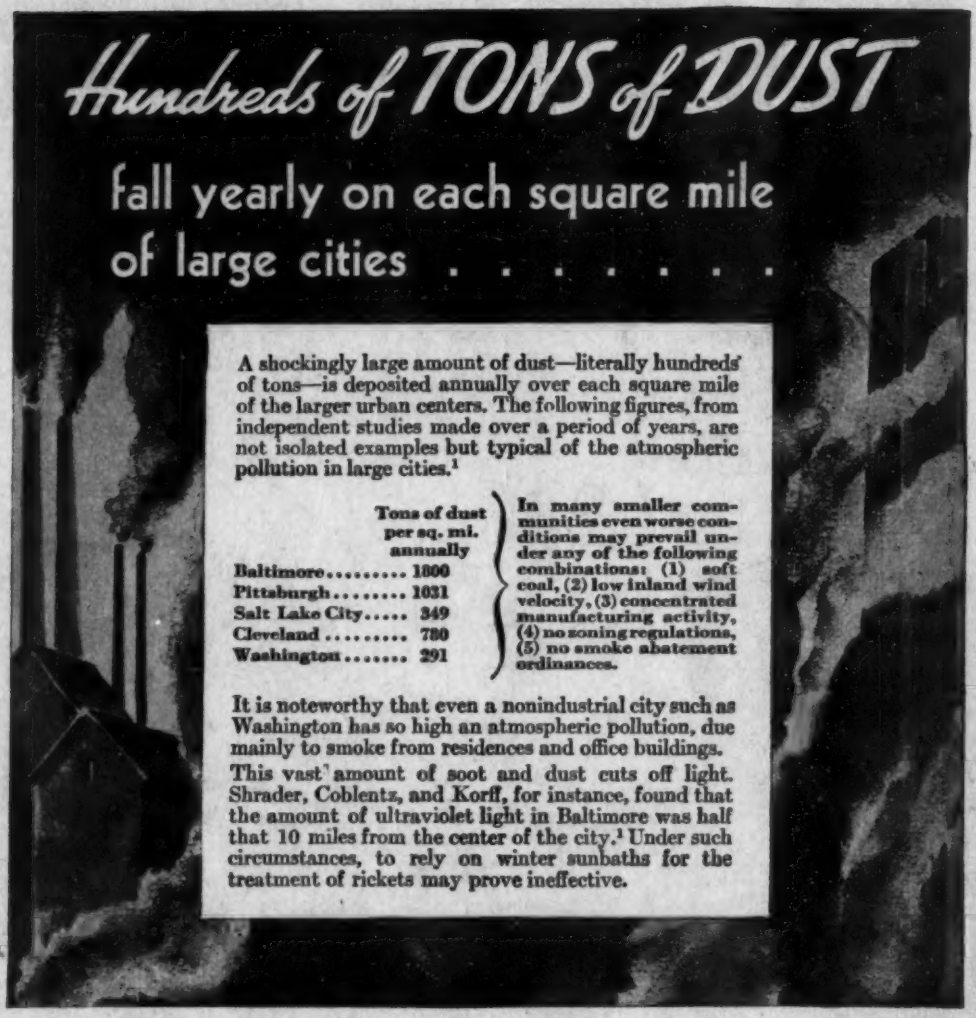
The ideal combination for individual use . . . Tempglass Thermometer in Kaybud self-sterilizing jar. Always handy . . . always sterile. No cotton necessary. Thermometer does not hit jar . . . simply insert through hole in moulded cap. No. 1002 TEMPGLASS Stub Bulb Thermometer in Kaybud Sterilizing Jar, as illustrated at right.

List Price - - - - $10.00 per doz.
Hospital Price - - $ 7.50 per doz.

Specify "TEMPGLASS" when you order clinical thermometers.



FAICHNEY INSTRUMENT CORP.
WATERTOWN, NEW YORK


Hundreds of TONS of DUST
fall yearly on each square mile
of large cities . . . . . .
A shockingly large amount of dust—literally hundreds of tons—is deposited annually over each square mile of the larger urban centers. The following figures, from independent studies made over a period of years, are not isolated examples but typical of the atmospheric pollution in large cities.[1]
Tons of dust per sq. mi. annually
Baltimore..... 1800
Pittsburgh..... 1031
Salt Lake City..... 349
Cleveland..... 780
Washington..... 291
In many smaller communities even worse conditions may prevail under any of the following combinations: (1) soft coal, (2) low inland wind velocity, (3) concentrated manufacturing activity, (4) no zoning regulations, (5) no smoke abatement ordinances.
It is noteworthy that even a nonindustrial city such as Washington has so high an atmospheric pollution, due mainly to smoke from residences and office buildings.
This vast amount of soot and dust cuts off light. Shrader, Coblentz, and Korff, for instance, found that the amount of ultraviolet light in Baltimore was half that 10 miles from the center of the city.[1] Under such circumstances, to rely on winter sunbaths for the treatment of rickets may prove ineffective.

a dependable antiricketic
OLEUM PERCOMORPHUM

A a cost to the patient of less than 1 cent a day you can prescribe 1,000 vitamin D units of Oleum Percomorphum, a dose regarded as adequate for the prophylaxis of rickets. At no additional cost the patient receives at least 7,000 units of vitamin A. Each gram supplies not less than 60,000 vitamin A units and 8,500 vitamin D units (U.S.P.). This means that the time-tried benefits of cod liver oil without its necessarily large dose are available even to premature and young infants, who are often most in need of antiricketic therapy. Supplied in 10 and 50 c.c. bottles and 10-drop capsules (boxes of 25 and 100).

[1] U. S. Public Health Bulletin No. 224.

MEAD JOHNSON & COMPANY, Evansville, Indiana, U. S. A.

Please enclose professional card when requesting samples of Mead Johnson products to cooperate in preventing their reaching unauthorized persons.